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RECENT ANTARCTIC DISCOVERIES

BY

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The month of March, 1912, must always shine bright for all geographers interested in Antarctic exploration. For in its first week the news was flashed round the world that the South Pole had been reached, and in its second week the further news came of the revisiting of Wilkes Land. These are both great events in the history of geographical discovery, and while it is still too early to speak definitely of their entire import, yet one may at least forecast it in a preliminary way.

Roald Amundsen, who had the slimmest possible financial backing, sailed from Norway in 1910, on the *Fram,* intending apparently to go into the Arctic Ocean through Bering Strait. On the way he suddenly changed his mind and started for the South Pole. With seven companions, he landed, towards the end of January, 1911, at the eastern end of the Great Ice Barrier and established in 78° 30′ S., near Balloon Bight or the Bay of Whales, winter quarters, which they called Framheim. Before the *Fram* returned north she reached 78° 41′ S. and thus has the furthest south as well as the furthest north record of any ship. Between February 10, and April 11, 1911, the land party established in 80°, 81° and 82° S., three depôts of supplies on the Barrier. The winter was spent on the Barrier. There was little snow and there was open water close by throughout the winter, although the temperatures were very low. There were only two moderate storms but many Auroras Australes.

For his journey over the ice, Amundsen, like Arctic travelers, pinned his faith to dogs instead of ponies, and he also used skis. Probably the life-long training on skis of Amundsen and his com-

rades in the Norwegian mountains had much to do with their success, as they were all experts and running about on skis was second nature to them.

In September, 1911, Amundsen started south, but the weather proved still too cold for the dogs, and he promptly returned to Framheim.

On October 20, 1911, Amundsen started again with four others. They headed Polewards over the Barrier, erecting snow cairns to guide them on their return trip. They passed their depôts and had excellent sledging. On November 9, in about 83° S., they sighted the mountains of Victoria Land. On November 11, they discovered a range of mountains running from Victoria Land towards King Edward Land. These formed a sort of bight in about 86° S., and this is apparently the southernmost point of the Barrier. The new mountain range is estimated as some 850 kilometers in length and received the name of Queen Maud Range.

On November 16, the party reached the edge of the Barrier in 85° S., where they established another depôt. On Nov. 18, they began to climb the coastal ranges. They traveled up several glaciers, some of them steep and difficult. Peaks from 10,000 to 15,000 feet in height were in sight. But until Amundsen publishes a chart, the geography of this locality cannot be clearly understood. The main glacier they traversed was called Axel Heiberg Glacier. On Nov. 22, they reached an altitude of 10,600 feet, and had, on account of a blizzard, to spend four days at this spot. After this experience, they continued south, the altitude gradually dropping. On Nov. 29, they were in 86° 21′ S., at an altitude of 8,000 feet, with another range before them to surmount. This they did in three days, going up a broken glacier, which was named the Devil's Glacier.

At the top of this glacier, the going was very hard. The ice was hummocky and full of concealed holes, into which one man and two dogs fell, but from which fortunately they were pulled out; and on this ice, skis could not be used. This place was called the Devil's Dancing Room. On Dec. 6, they reached their greatest altitude, 10,750 feet, in 87° 40′ S. From here on their road lay over a level ice plateau. On Dec. 8, they passed Shackleton's most southern latitude; on Dec. 11, they reached 89° 15′ S.; on Dec. 12, 89° 30′ S.; on Dec. 13, 89° 45′ S.; on Dec. 14, 89° 55′ S. The following day they took a series of careful observations in beautiful weather, and then traveled the remaining 9 kilometers, arriving at the actual South Pole during the night of Dec. 15-16.

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The South Pole is situated on a great ice plateau, which was named King Haakon VII Plateau, a name which must be held to include the ice cap in all directions beyond 89° S. The temporary camp was named Polheim. Here they stayed until Dec. 17, making more careful observations.

On Dec. 17 the explorers started back, and favorable weather made the return journey easier than the journey to the Pole. They reached Framheim on January 25, 1912.

While Amundsen and his party were away south, Lieutenant Prestud and two others made a trip to King Edward Land, confirming Captain Scott's observations and bringing back numerous geological specimens.

The *Fram* arrived at the Bay of Whales on January 9, and on January 16, the Japanese expedition also arrived there and landed on the Barrier. The *Fram* then left the Bay of Whales on January 30, and, after a slow voyage with contrary winds, arrived at Hobart, Tasmania, on March 7, 1912.

Of the services to geography of Amundsen in the South Polar regions, one must write with the most unstinted praise and admiration. While it is impossible to draw absolutely final conclusions about them until Amundsen publishes some charts and until Scott's results are announced, it may be stated now that Amundsen has solved more problems and more important problems than anyone else. The main results of Amundsen's well planned trip are five in number:—the attainment of the South Pole: the discovery that Antarctica is one continent and not two land masses: the settlement of the boundaries of the Great Ice Barrier: the discovery of 500 miles of the coast line of West Antarctica: the discovery that the ocean does not wholly freeze over in the far south.

The attainment of the South Pole was a great physical feat. It is a feather in Amundsen's cap and will doubtless remain his most enduring title to fame. It was the greatest geographical prize remaining, and Amundsen well deserves any honors he may receive for it, even if, and it does not seem likely, Scott reached it first. Amundsen's journey was well conceived and admirably carried out. It seems strange, however, that Amundsen's was only the third definite attempt to reach the South Pole. First came Scott, then Shackleton, then Amundsen. Their journeys followed the law of evolution, Scott breaking the way for Shackleton, and Shackleton in turn doing so for Amundsen. The discovery of the South Pole is a most important discovery, and all geographers of to-day must feel pleased that it was made in their lifetime. Is it as important,

however, geographically and scientifically as the solving of the mysteries of the continent and of the Ice Barrier?

In considering whether the most important result of Amundsen's trip is not the settling of the question of Antarctica being one or two land masses, it is necessary to look back a little. Since de Gerlache opened the ball of Antarctic scientific investigations, two schools, so to speak, have formed themselves of believers in one land mass or in two land masses. For instance, in 1910, Dr. Penck published, in connection with the Filchner expedition, a map* showing West Antarctica and East Antarctica separated by a blank space between Weddell Sea and Ross Sea, marked "Land oder See?" On the contrary, in 1911, Dr. Bruce published a little chart† showing Antarctica as one mass. The writer himself, remembering Sam Weller's remark, "Not knowing, can't say," has always avoided committing himself on this matter, which at best was mere guesswork. Thanks to Amundsen, the question is settled and there can be no reasonable doubt that Antarctica is one whole continental land mass, with at least two large gulfs in it, something like the Gulf of Carpentaria and the Great Australian Bay in Australia. Wilkes's name The Antarctic Continent and Murray's name Antarctica are therefore thoroughly justified by actual proof.

The next greatest geographical problem solved by Amundsen is that of the Great Ice Barrier. This also has long been a mystery. Some geographers have held that it was bounded by mountains, others that it connected with the icy shores of Weddell Sea. It turns out that it is bounded by mountains. This settles the geographical part of the problem. This does not, however, although much has been learned, settle the scientific part of the problem. The push to the Barrier, which slowly sends its ice northwards, is left unexplained in Amundsen's report. He says of the Axel Heiberg Glacier, which lies beyond the coast mountains, that its broad cracks and open crevices were apparently mostly filled up, as the glaciers in all probability long ago stopped moving. He says nothing, however, of the glaciers abutting directly on to the Barrier. It would seem therefore most probable that it is the innumerable coastal glaciers which flow from the mountains surrounding the Barrier, which supply at least part of the motive power which shoves this immence ice mass forward. If so, and although many of the phenomena—such as how much of the ice is formed by the freezing of the salt water surface and the building up of this ice by long

* *Zeitschrift der Ges. für Erdkunde*, Berlin, 1910: republished by Dr. Otto Nordenskjöld; *Die Schwedische Südpolar Expedition*, 1911, p. 66.

† *Polar Exploration*, p. 8.

years of snowfall—are unusual and sometimes peculiar to the Antarctic regions, yet it seems now as if the Great Ice Barrier and similar formations sometimes called shelf ice or bay ice must be accepted more than heretofore as being akin to true glaciers.

The mountain range discovered by Amundsen and named by him Queen Maud Range, rises on a land which is as yet nameless. This land is a part of the coast line of West Antarctica, for, between 86° S. and King Edward Land, it forms the eastern shore of the great bay or gulf whose western shore is South Victoria Land, which gulf is known as the Ross Sea in its northern reaches and as the Great Ice Barrier in its southern frozen portion. It is indispensable that this coastal land, some 500 miles long, should have, like all other stretches of the coast of Antarctica, a name of its own, to enable geographers to speak of it distinctively and accurately, and I suggest christening it by its self-evident name of Amundsen Land.

The discovery that there was open water during the winter close to the Barrier is a most interesting fact which no one even dreamed of before now. Everything so far noted as yet, has shown that the surface of the ocean round the Antarctic shores freezes during the winter, and finding open water at that period off the Ice Barrier is most remarkable. Why this should be so with the extremely low temperatures noted at the same time is a mystery, and one offering room for much speculation and further observation.

Almost as interesting as the discoveries of Amundsen are the reported landings, cabled from Tasmania on March 13, 1912, of two parties from the Australian expedition, on the steamship *Aurora,* at two points of Antarctica. One party is under Dr. Mawson, the other under Mr. Wild, both members of Shackleton's expedition. The cablegram stated that one party was at Adélie Land, the other at Termination Land. This is welcome news, for it proves finally and absolutely the existence of Wilkes Land.

The cablegram, however, says that the *Aurora* found no trace of the Clarie coast, from which it is inferred that it was an ice barrier that has broken up since D'Urville discovered it in 1838. We must hope for further information before long on this interesting matter. Wilkes states that beyond the ice barrier, which was about one hundred and fifty feet in height, the outline of the high land could be well distinguished and that he called it Cape Carr. It must also be noted that D'Urville's dates on his Antarctic trip are incorrect and given as one day earlier than they really were, and that it was not D'Urville who discovered the Clarie coast on January 29, 1840, but Lieutenant Ringgold, U. S. N., commanding the

U. S. S. Porpoise of Wilkes' expedition, who did so on January 30, 1840: a fact established by Rear Admiral John E. Pillsbury, U. S. N.*

It is a pity that America let slip her opportunity of herself vindicating the most important geographical discovery ever made by an American, when in 1909 and 1910, a number of scientific societies, among them the American Geographical Society, urged the United States Government to send a Navy expedition to re-explore Wilkes Land. But Americans must be grateful to Dr. Mawson, Mr. Wild, and their Australian comrades, for proving, by the actual treading of its snows, that Wilkes Land exists where Wilkes located it. And we may hope for further news by this time next year.

Charles Wilkes was a New Yorker, born in the City of New York, April 3, 1798. He is certainly one of her most famous sons, whose fame is bound to grow in the centuries to come. Why does not New York take some action to honor him, by putting up a statue or some other memorial to the man who first announced to the world that there is a great Antarctic Continent? There are some good sculptors in New York City to whom such a monument could be safely intrusted.

In looking towards the future, is it not questionable whether the discovery of the South Pole so early in the game is not rather a misfortune than a blessing? To the average person, Antarctic discovery meant reaching the South Pole, and now that the greatest incentive to which appeal could be made has been eliminated, when money is required for further exploration it will be much harder to get, for the average person holds the purse strings. Fortunately there are two other expeditions actually in the Antarctic, that of Dr. Mawson in Wilkes Land, that of Lieutenant Filchner in the Coats Land region, and these may be expected to bring back much valuable knowledge.

But there are other portions of Antarctica of which we still know almost nothing. West Antarctica, between Charcot Land and King Edward Land, from W. long. 75° to W. long. 150°, is a blank on the maps. De Gerlache and Charcot both felt the continental shelf in sounding, the first in the neighborhood of 85° W., the second in about 120° W. But *terra incognita* can still be written there on the charts. So it can be between 15° W. and 85° E., between Coats Land and Kaiser Wilhelm Land, for, except the two landfalls of Biscoe and Kemp at Enderby Land and Kemp Land, nothing whatever is known of that immense area of the surface of the globe. There may be mountain ranges, or ice cap plateaus, or huge gulfs,

* *The National Geographic Magazine*, Vol. XXI, 1910, pp. 171–173.

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but no one knows. And unfortunately such problems do not appeal to the public. We can only live in hope that Charcot may find the wherewithal with which to pursue his investigations in West Antarctica, and that some one will undertake the exploration of Western East Antarctica. If an American Antarctic expedition should ever be thought of again, the region in which further effort would now be most fruitful would be precisely that of Western East Antarctica, between Enderby Land and the South Pole.

Philadelphia, March 20, 1912.

ECONOMIC PROSPECTS OF NEW BRITISH COLUMBIA

BY

FRED. A. TALBOT

Enterprises in British Columbia have hitherto been content chiefly to exploit the mineral and agricultural wealth in the southern part of the province within easy reach of the first Canadian transcontinental railroad. The northern land has commonly been regarded as an inhospitable mountain region capable of little development. Pioneering did not pass beyond the Cariboo gold field district until a few years ago, and even then was attended with considerable hardship and privation.

The physical features of the region were responsible for this neglect. The Canadian Pacific Railway is flanked by the Rocky, Selkirk, and Gold Mountain ranges and a bad bit of alkali plateau where life is quite insupportable. The presence of this narrow but arid belt was sufficient to deter all excepting those interested in mining and prospecting, and kept pioneer farmers from venturing northward. Entrance to the northern land by way of the Fraser River was impossible owing to the cañons and gulches through which the stream rushes at frantic speed, making it unnavigable.

The discovery of gold in the Klondike prompted a few gold seekers to wander from the northern limit of the Cariboo road through the unknown country beyond. Some pushed on from Barkerville, the leading town in the Cariboo gold country, gaining the southern bank of the Fraser River at Giscombe Portage. They crossed the river and then trekked overland for a few miles to Summit Lake, one of

the fountain heads of the Peace River, followed the Parsnip River north till it reaches the Peace and then struck out overland to the northwest and Dawson. Others gained the Fraser River at Soda Creek, the south limit of navigation on its upper reaches, and then struck directly northwards. As they advanced they were astonished to find that the interior became a succession of rich fertile valleys. Many of the gold seekers abandoned their journey to the Klondike to settle upon the land, while others, after gaining the goldfields and failing to meet with fortune, retraced their footsteps to the agricultural stretches of New British Columbia, to settle upon the land. The result is that the oldest settlers in this country to-day are Klondike sourdoughs, who have won more wealth from the alluvial soil in the wide depressions among the low hills than they could obtain from the rocks and rivers of the Yukon Territory.

The real opening of the country, however, is coming from the construction of the second trans-continental railroad across Canada—The Grand Trunk Pacific. This line traverses the richest and most promising areas, for the track usually follows the waterways so long as they flow in the desired direction; and as soon as one river is left, another waterway is picked up. The result is that the railroad has a low ruling grade—not exceeding 21 feet per mile—and indeed the summit level between the Yellowhead Pass in the Rocky Mountains and the seaboard at Prince Rupert is approximately the same as that on the prairies between the Yellowhead Pass and Winnipeg.

I spent a part of 1910 crossing through the heart of this country by packhorse and canoe, the journey occupying nearly six months. My purpose was to study the economic possibilities of the country, and its general physical characteristics. At that time the Grand Trunk Pacific had been advanced westwards from Winnipeg to the west limit of the prairie division, and the construction forces were preparing to attack the mountain section. The official boundary between the prairie and mountain divisions is Wolf Creek, just above the junction of this stream with the Mac Leod River, a mile west of the present station of Thornton. Wolf Creek lies at an elevation of 2,855 feet, while the railroad at the Yellowhead Pass, 130 miles beyond, is at 3,720 feet.

Physically, the country changes abruptly at this point. The rolling prairie, with its gentle undulations, gives way to heavy rolling country, low hills of increasing height rise one above the other, and are separated by the winding course of the Mac Leod River. Poplar is interspersed with jack-pine growing in gravelly soil, but there are numerous patches, often of large area, where the cottonwood

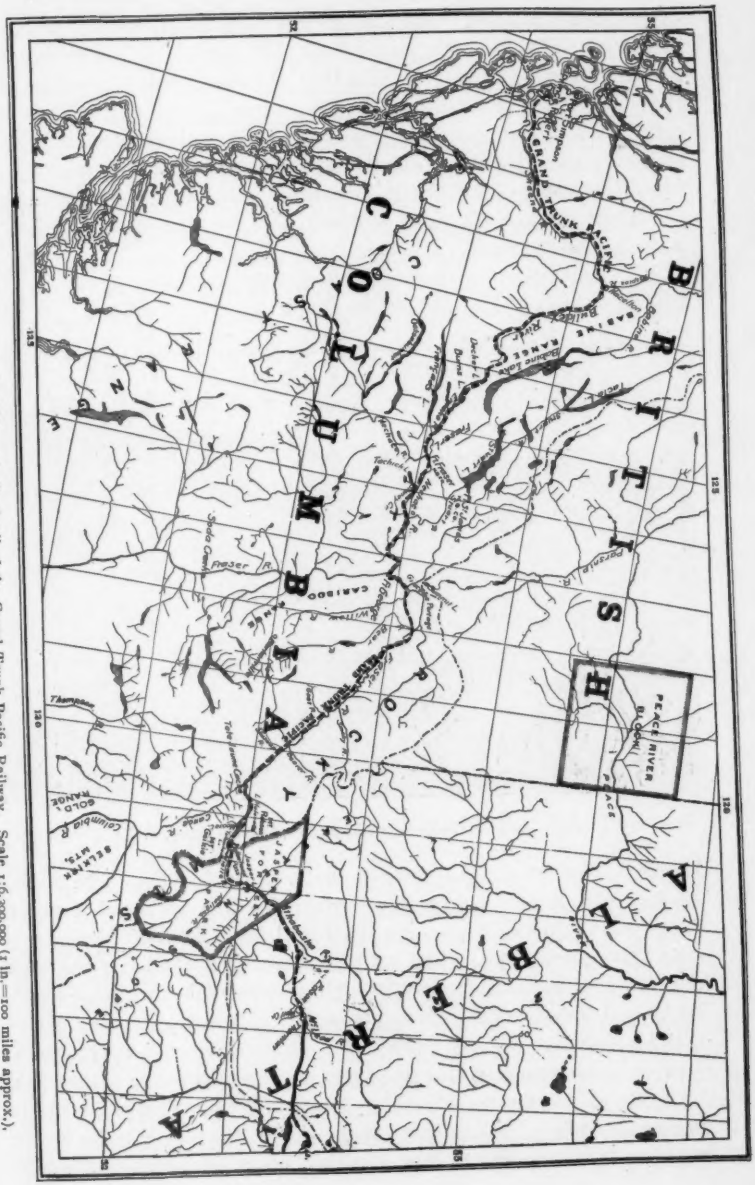

FIG. 1—Sketch Map showing the route of the "Mountain Section" of the Grand Trunk Pacific Railway. Scale 1:6,300,000 (1 in.=100 miles approx.). Based on the Map of Western Canada, 1:1,267,600, published by the Department of the Interior, Ottawa, 1910.

flourishes luxuriantly, and the dark loamy soil gives every promise of profitable farming. Agriculture here, however, holds out hope of success only to truck farmers, for the surface is too broken to admit of plow cultivation. The hill slopes dropping towards the river in a series of steps, and with a southerly aspect, should prove excellent for fruit farming. The country is well watered, bubbling creeks are found on every hand, and stock-raising should be successful. The upper sides of the hill slopes are covered with a heavy growth of grasses affording fine feed, and the area of these grazing areas can be extended.

The land makes a somewhat steep ascent in the course of the first fifty miles as the Athabaska Divide has to be crossed. As the

FIG. 2—Oats and barley near Stony Creek, Nechaco Valley, B. C.

Divide is climbed the character of the country changes. The whole of these slopes was formerly covered with fine timber, but about forty years ago the trees were destroyed by a fire that devastated over 150 square miles. The result is that the ground is piled with deadfall hidden from view by a high growth of bush. The soil is rocky and for the most part worthless, though it might prove excellent for summer grazing if cleared. Drainage would be required, however; our progress was prolonged by the prevalence of muskeg.

The trail crosses the Divide at about 5,000 feet, but the railroad passes the ridge at a lower elevation—3,560 feet—some miles to the north. The descent of the western slopes is somewhat easier,

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inasmuch as there is a depression having a mean altitude of about 3,200 feet lying between the Divide and the Yellowhead Pass of the Rockies. There are many fertile areas in this district, but they will not be open to the farmer because this district has been set apart by the Dominion Government as a National Park which, with its heavy timber and other primeval characteristics, extends over an area of 5,000 square miles to the western border of Alberta in the Yellowhead Pass. It has been named the Jasper Forest Park. This country was once the home of game, but the Indians have well-nigh depleted the forests of animal life, though it is hoped, by extending protective measures and evicting the Indians, that the remnants will be able to propagate freely, so that the enclosure may again become stocked with bear, lynx, deer, beaver, etc., as well as fowl of all descriptions.

At the point where the Athabaska debouches from the mountains the rift in the foothills is about a mile wide, the waterway occupies the greater part of this space, the main channel is about 600 or 700 feet across, and many sloughs and lakelets constitute the flood-water courses on either side. The river swings along in an north-easterly course at about eight miles an hour, widening at frequent intervals to form large lakes. On the north bank the foothills, almost bare of plants, rise abruptly and the exposed strata are penetrated by many dykes and much folded. The foothills range in height from 5,000 to 8,000 feet, and on the eastern and northern faces are precipitous and bare.

Once the portal is entered, the mountains fall back somewhat, forming a huge amphitheatre in which Jasper Lake is a conspicuous feature. On one side, the lake, which is merely a widening of the Athabaska River, is flanked by the bow-shaped Fiddleback Range, the peaks of which vary from 8,000 to 10,000 feet in height; while on the other sides the mountains rise to about the same altitude.

The entrance to the Rocky Mountains promises to become of importance. High up on the slopes of the Roche à Miette hot springs of therapeutic value, and the hottest so far discovered in Canada, are to be exploited; while on the southern bank of the Athabaska overlooking the Grand Trunk Pacific Railway, a rich bed of coal has been struck. This is evidently an extension of the Brazeau coal field which has been tapped as far south as Calgary, and in greater richness within easy distance of Edson, about twelve miles west of Wolf Creek. In Jasper Park the seams were found a few feet below the surface. The coal is a low grade anthracite similar in character to some coals found in the English fields. It is of excellent

calorific value. The seams dip beneath the Athabaska River to reappear upon the northern bank. Some 13 square miles of this coal field have been surveyed, and development work is now under way.

The Athabaska follows a gently winding course between two towering and almost vertical, cliffs. On a wide bench at the foot of the northern cliff the railroad is being built. Majestic mountain scenery is on every hand, the dominating feature being Mount Geikie (11,000 feet), while to the southwest is Simpson Pass, where the Athabaska takes its rise. On the south side, the river is swelled by the Maligne River, flowing from the lake of that name and which for a great part of its distance plunges through a subterranean tun-

FIG. 3—View of Mount Geikie from the hillside showing the Athabaska and the peaks alongside forming Simpson Pass.

nel, formed evidently by large masses of rock having become detached from the mountain slopes above.

The Athabaska describes a sharp bend to the southeast near the foot of Mount Geikie, and at this point is fed by the Miette River, which comes in from the north, through a narrow defile. An abrupt change in the character of the vegetation was observed to the west of this river. The small jack-pine gave way to the towering bastard Douglas fir, while the flora became distinctly British Columbian in character and variety. In a few minutes we stood in the Yellowhead Pass, which is a gap in the Rocky Mountains 1,000 feet or so in width, at an altitude of 3,720 feet. The Great Divide at this point is so slight that the Miette River, which normally flows

southwards to join the Athabaska, in times of flood sends its surplus waters to form a small creek that empties into Yellowhead Lake, so that, seasonally, the river flows both westward and eastward.

The descent from the Pass is gradual through a burnt country with a wealth of wild grass and dense bush. Soon we caught sight of Yellowhead Lake and from the trail around its north shore we had a fine view of Mount Pelée, rising sentinel-like from the wealth of trees on the opposite bank. The lake is an irregular sheet of water and its outlet is a small creek forming one arm of the Fraser River, which, in a mile or so, joins the first arm of that waterway, foaming down the mountain slope on which it takes its rise.

The country along the upper reaches of the Fraser river is scenically grand. The trail and also the Grand Trunk Pacific Ry. follow the northern bank, keeping somewhat towards the foot of the mountains, inasmuch as the land immediately fringing the waterway is marshy, forming a chain of muskegs which are dangerous and difficult to cross and are concealed under a heavy growth of marsh grass. The mountains rise steeply from the southern bank and are clad from water to snow line in timber through which creeks and waterfalls cascade into the Fraser. Numerous creeks rush down the northern slopes into the waterway and at places are treacherous to cross.

The country is extremely diversified. At places the mountains press so closely together as to form merely a gulch, while at other points they roll back leaving wide, long stretches of meadowland, somewhat sodden with water. These verdant alcoves among the mountains are good situations for truck farming, and dairying should prove profitable when town and scenic centers are developed at good points for mountain climbing or for viewing the wonderful scenery. Many of these meadows are quite open and only require slight draining to bring them into productivity. They are saucer-like depressions with the river bank forming the rim. They may easily and cheaply be pierced at intervals to drain off the surplus water, leaving a rich loam of great depth, with which is mingled a vast quantity of natural fertilizer in the form of decayed vegetable matter and mosses.

This district, however, will depend essentially for its prosperity upon its scenic attractions. It is the lake land and mountaineering country of Canada. So far as the waterscapes are concerned, there are the Yellowhead, Moose, and Helena Lakes, all of which are of great length and depth, suited for gasoline launches, while the waters on all sides are hemmed in by lofty mountains, the majority unnamed

and constituting virgin ground for the Alpine climber. Foremost among the peaks is Mount Robson, the highest point in the Canadian Rockies, the massive ice-cap of which is at an altitude of 13,700 feet. In the neighborhood are innumerable other lofty peaks rising upwards of 11,000 feet. From the sporting point of view there are endless possibilities. The forests around the base of Mt. Robson teem with bear, especially grizzlies, while the Fraser River, the numerous creeks and lakes abound with fish. One lake we found to be alive with rainbow trout, thirty of which we hooked, in half an hour, with rod and line, scaling up to 15 ounces; and from the Fraser we obained large quantities of trout and Dolly Varden trout.

Between Yellowhead Lake and Mt. Robson the Fraser River is unnavigable even by canoes, for it abounds with rapids, falls, whirl-

FIG. 4—Tête Jaune Cache. Fraser River in foreground. Mica Mountains behind.

pools and small cañons. At places it is barely 30 feet in width, while at others it widens out to a width of one or one and a half miles. After leaving Mount Robson it becomes wider as, in rapid succession, it is swelled by the South Fork emptying from Lake Helena, Swift Current, and other less imposing creeks. Consequently by the time Tête Jaune Cache is gained it has attained a width of about 350 feet, and hurries along at about seven miles an hour.

The descent from Mt. Robson to Tête Jaune Cache, some eighteen miles, is somewhat sudden and the configuration of the country is such that the engineers of the railroad found it impossible to adhere to the prescribed grade of 21 feet per mile, so a pusher section had to be introduced to overcome this difficulty. At Yellowhead Pass,

the summit of the railroad between the Atlantic and the Pacific seaboards, the track reaches an altitude of 3,720 feet, but in the course of the next fifty miles it drops 1,200 feet, Tête Jaune Cache being at an altitude of 2,524 feet.

At this point, the Rocky Mountains come to an abrupt termination along the river banks and the country opens into a valley about twenty square miles in area. Geographically this is a very interesting point in British Columbia, for standing upon the ridge on the north side of the Fraser River, one looks down not only upon that waterway but also sees the Glennan River, furthermore, the upper part of the Thompson River and the headwaters of the Canoe River, which flows almost due south to join the Columbia.

Tête Jaune Cache is the head of navigation for small draft steamers upon the upper Fraser, there being a clear, good waterway from this point for 470 miles west to Soda Creek. It is also the highest point which the salmon gain when on the run, for the bars and sandbanks in the waterway in the vicinity of the Cache constitute their spawning grounds. Further progress up the river is barred by a fall about 30 feet in height which is naturally beyond the leaping capacity of the fish after their exhausting long run up the river. Large numbers of the fish are caught by the Shuswap Indians living in the vicinity, trappers, and others, the general method of capture being by spearing at night with the aid of a lantern.

At this point, owing to the trail coming to an end, Siwash dugouts were taken in order to reach Fort George; but before embarking upon the second part of the journey, opportunities were given to investigate the arable possibilities of the land in the region of Tête Jaune Cache. A gold prospector had squatted upon a quarter section and had brought a small patch under cultivation, raising lettuce, onions, and other vegetables. The soil is light, sandy loam, easy to work, and eminently adapted for vegetables. The mountain slopes rise in regular benches, and as the whole country has been burned off by forest fires, the preliminary operations are light. The mineral resources are confined at this point to mica, one mountain being named after this material owing to the illimitable quantities of this mineral. The soil indeed for some distance around is heavily impregnated with pulverized mica schist. I was told the mineral was mined fairly easily and that sheets up to twenty-four inches square of white mica had already been obtained. A nickel ore had been found also in small quantities and some excellent specimens of gold ore had been obtained in the neighboring mountains.

Once afloat on the Fraser River we were soon impressed with the velocity of its current and could realize why its discoverer, after whom it is named, christened it the "Bad River," for it demands skilful navigation in an Indian dug-out. Timber jams of huge proportions constitute one of the greatest dangers. Some of the collections of large timber along the shores were over two miles in length. For the first twenty miles the mountains crowd upon the southern bank, a mass of peaks. On the north bank the configuration is somewhat easier, the land sloping up gradually from the water's edge.

The valley through which the Fraser flows is of great width, judging from the distance between the opposing rows of peaks, while the waterway winds from side to side. Its course is roughly northwest for nearly 300 miles and a third of this distance is represented by twists and bends. The railroad, although laid along its bank, at the same time cuts across the chord of the horseshoe bends, so that, though by water the distance from Tête Jaune Cache to Fort George is about 320 miles, by rail, it will be only 210 miles. Some of the loops formed by the river are no less than ten miles around, while by striking across country at the neck of the loop less than half a mile of portage is required.

This part of British Columbia is probably the least known, but it is one destined to occupy a prominent position in the near future. It can only be described as "Nature's Garden," inasmuch as the soil is suited to the production of any root crops, and even bush fruits. The climate is ideal. In summer the thermometer hovers around 80°, but welcome showers temper the heat and bring moisture to the vegetation. The topsoil is an accumulation of decayed vegetable matter up to 24 inches in depth, with an alluvial loam beneath. The possibilities of the soil were shown by the prolific growth of bracken, which grows to a height of five feet with stalks resembling sugar canes.

The timber wealth of this country is illimitable. The lower-lying portions are covered with dense forests of pine in which the Douglas fir predominates, with hemlock, balsam, birch, and, back of the river, are immense groves of cedar, their trunks often having a girth up to thirty feet. For the most part, fire has wrought little damage in these timber reserves, though here and there are bleak stretches of black country, desolated by fire. The timber stretches as far as the eye can reach from the river to the snow lines on the distant mountains. On the lower lying hills the trees have a peculiar emerald green hue, due to the frequent rains. The country,

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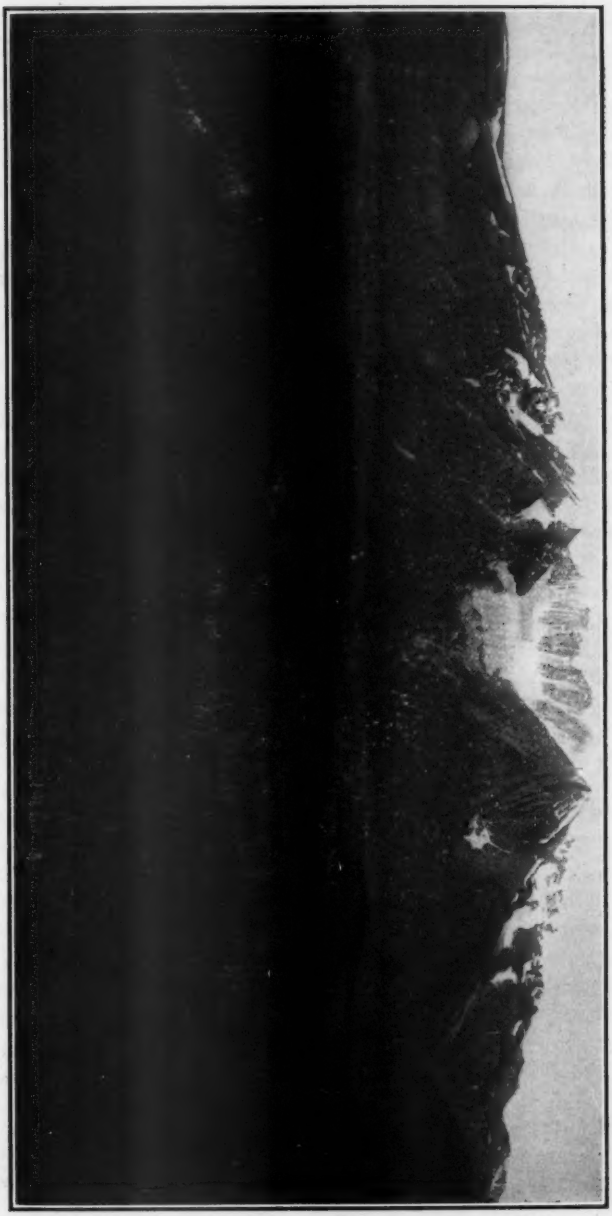

FIG. 5—Hudson Bay Mountain and its noble glacier from five miles distant.

however, is impenetrable for more than a few feet from the water's edge, owing to the density of the forest. This is not surprising, as the country is in its primeval condition. The only way of penetrating the regions back of the river is along the numerous waterways which flow into the Fraser on either side, such as the Shuswap, Beaver, Smoky, Goat, Bear, Willow, and Salmon Rivers and the North Fork of the Fraser, the junction of the latter being about 80 miles north of Fort George.

The country is rich in game of all descriptions, bear being exceptionally plentiful. There are promising strikes of gold on the Rau Shuswap and the Beaver Mountains overlooking the river of the same name. The extent of alluvial gold in the lower reaches of the Fraser has pointed conclusively to the fact that in the higher reaches large deposits of this mineral must exist, but the difficulties and dangers of following up the river have been unfavorable to prospecting upon a methodical scale. The find on the Beaver River is reported to be the best discovery up to the present, and that the deposits must be somewhere in the neighborhood of these mountains is proved by the fact that the Fraser reveals only very slight traces of alluvial gold east of this point. All the creeks and rivulets, however, upon being tested with the pan showed colors.

The railroad leaves the Fraser River at Fort George, which is at the southern edge of the great interior plateau forming New British Columbia, crossing this waterway to pick up the southern bank of the Nechaco River which joins the Fraser at this point, the meeting of the waters constituting a lake. Fort George lies at an altitude of 1,880 feet, and in the course of the next 150 miles the railway makes a gradual climb, running almost due west to Fraser Lake, and then bears towards the north to gain the Skeena River. The Nechaco River follows a somewhat winding course, draining a large tract of low-lying country which was formerly a lake bed, and of which inland sea the Français, Stuart, Fraser and other lakes remain. The Nechaco is the outlet of the Fraser and Français Lakes, while its tributary, the Stuart, drains Stuart Lake. Owing to these lakes being the headwaters of the river, its volume does not vary appreciably, for the lakes act as balancers. The railroad follows the course of the Nechaco, thus traversing the lower lying parts of the country. The soil being alluvium associated with a thick layer of decayed vegetable matter, is extremely fertile, while the subsoil being clay keeps moisture within reach of vegetation. The topsoil varies from two to eight feet in depth. Convincing evidence of the fertility of this soil is supplied by the growth of vetches

and wild grasses. Wild timothy tops five feet in height, and averages between three and five tons per acre, while the sugar-cane grass grows to six or seven feet and is rivaled only by the prolific growth of the pea vine. The country has been burned over for the most part, and the second growth of timber comprises merely young cottonwood and willow, which can be cleared easily.

The recurrence of these stretches of meadow constitutes one of the most notable features of the country, and although the altitude is about 2,000 feet, it is considered to be no handicap to any class of agricultural production. Truck gardening, dairying, and cattle raising offer the greatest chances of success. On the whole, the land is too rough to admit of grain raising upon a sufficiently extensive scale to enable machinery to be used, while it is doubtful if the uplands would be suited to grain even if it were practicable. These stretches, on the other hand, as well as the steeper slopes covered with cottonwood, are well suited to cattle raising, inasmuch as the prolific growth of fodder among the trees assures ample sustenance for animals. The equable climate is conducive to this end. The winter is mild and in many places it is possible to keep stock out of doors the year around. This result is due to the full benefit which this region derives from the chinook wind, as the country lies in its path and its influence is felt as far away as the Peace River country. Pioneer settlers who have had some years of experience say the country is of no use to any but experienced farmers carrying on mixed farming. The most successful settlers I met were either British, or Eastern Canadian farmers, and Chinese, the latter being exceptionally successful in truck gardening.

Fort Fraser will probably develop into an important point. At the time of my visit it contained only the Hudson Bay Trading Post, the operator of the Yukon telegraph line, and an Indian village. The Indians are numerous throughout the country, having established large villages, the most important of which are at Fort George, Stoney Creek, and Fort Fraser. They are coast Indians of the Siwash tribe, and, on the whole, are lazy and thriftless. They own the cream of the country and, as their lands comprise the most extensive open areas where grasses grow luxuriantly, the work of tending their stock is reduced to a minimum. In their patches of garden, potatoes looked sickly, but this was due entirely to poor methods and poor seed. At Fort Fraser they were trapping salmon which had made their way up from the Pacific to spawn in the Fraser and Français Lakes. The fish were in fine condition considering their long and exhausting journey, but the yield was small.

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The Indians gain a bumper harvest of fish only once in three years, a mystery that is still unsolved.

During the next few years a fleet of shallow-draft steamboats are to be launched on the Upper Fraser River, with headquarters at

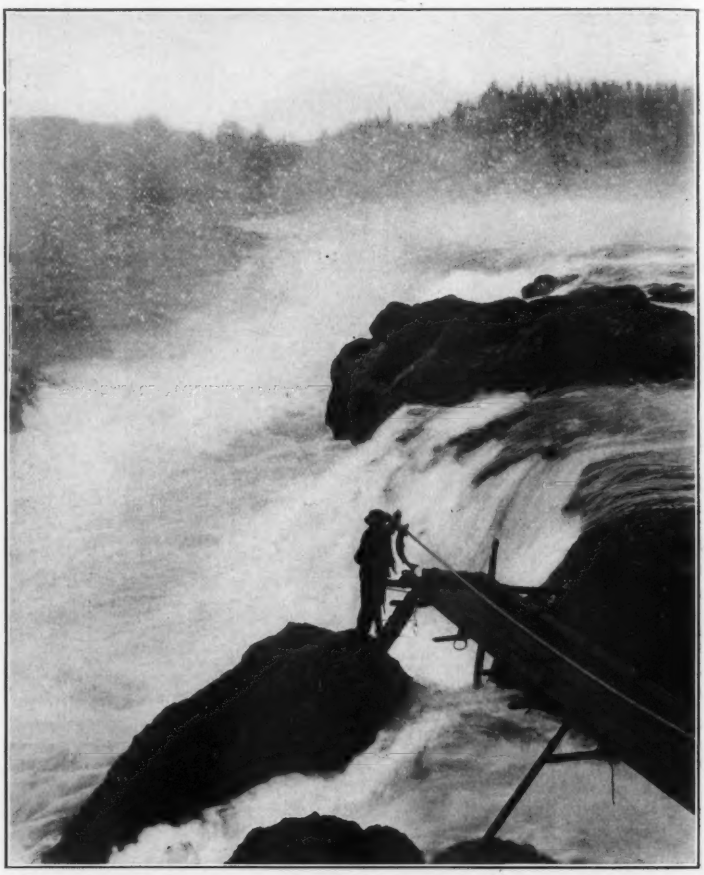

FIG. 6—Salmon fishing on the Bulkley River, Moricetown, B. C.

Fort George and Soda Creek, 150 miles south. As this region has over 1,000 miles of navigable waterways, the waterborne traffic will have considerable importance. On the Fraser there is a clear run of 470 miles between Soda Creek and Tête Jaune Cache, with Fort George as the center, while these vessels can steam up the Nechaco

and Stuart Rivers, into Stuart Lake, and thus keep in touch with the Hudson Bay Post of Fort St. James, or ascend the Nechaco River to Fraser Lake. It is even expected that the smaller craft will be able to make their way into Français Lake, navigating that 70-mile stretch of water from end to end. This will open up the fertile grazing and arable areas of the country surrounding the Français and Ootsabunkut Lakes.

The railroad follows the course of the Endako River (which empties into Fraser Lake), to Burns Lake and then past Decker Lake to pick up the headwaters of the Bulkley River. There is a

FIG. 7—On the Skeena River, B. C.

gradual climb, as the low ridge known as the Bulkley summit has to be overcome, the grade reaching an altitude of 2,366 feet, approximately that of the summit level on the prairie division between Wolf Creek and Winnipeg. Much of the land to the north of the line through this country is not suitable for any branch of agriculture excepting stock raising, as the country is too rough for farm machinery and the hills lead up to the Babine Range. Here and there are promising open spaces, many of which have already been taken up, and excellent results are being achieved.

But the land which has proved the greatest agricultural surprise

is the Bulkley Valley. This depression is low. The railroad descends from the summit to the waterway, this descent continuing in fact for the next 120 miles until the Skeena River is gained. This valley, like the two preceding valleys, is an old lake bed, with a very thick deposit of alluvium. At the Pioneer Ranch the soil, over an area of 1,000 acres which has been cleared, ranges up to thirty-two feet in depth. Produce grows with exceptional luxuriance, turnips being pulled which measure 36 inches in circumference and weigh 15 pounds; cabbages resembling large bushes; carrots 24 inches in length; parsnips measuring six inches across the crown; and so on. The timothy averages between five and six tons per acre, while the wild timothy, which grew to a height of nine feet, ran about five tons per acre. The oats topped five feet, and though the ranch is surrounded by dense forest, no ill effects appear to be suffered from summer frosts, although the grain was in the milk. The soil was free and worked easily, there being no signs of outcrop of gravel or rock. The cattle were in prime condition, yielding rich milk and fine beef. Wild gooseberries, currants, and strawberries were being cultivated with much success, as the berries were twice the size and of better flavor than those we plucked in the wild state. These conditions prevail throughout the valley and the settlers with whom I conversed expressed complete satisfaction with their situation and fortune.

The Bulkley Valley is limited in area, as the Babine and Coast Ranges run diagonally towards one another and meet at the northern end of the depression. While the Babines protect the valley against the north and east winds, the rifts in the Coast Range permit the free passage of the chinook winds, which accounts for the fact that the snowfall rarely exceeds twenty inches. Indeed, a lesser depth usually prevails, and the melting influence of the warm winds serves to keep the soil mellow and moist. In the summer, when the thermometer ranges between 80° and 90°, warm rains from the west keep the crops in prime condition, affording them refreshment just at the time when they require it.

In this country mining and agriculture will rival one another, for the mountains are rich in minerals. The Babines have yielded excellent strikes of galena and lead, while copper ranging from a low grade ore of 2 per cent. to almost virgin metal of 90 per cent. have been found. Gold is in small quantities, but lead and copper predominate. On the western side of the valley in the Coast Range a rich deposit of coal has been found extending over 25,000 acres. Other strikes of coal have been found throughout this territory, and

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the abundant supplies of this fuel are of good augury for the mining industry.

To emerge from this valley the railroad tunnels through a shoulder of the mountains, this being the longest tunnel on the whole line—about 3,000 feet. Leaving the mountains the Skeena River is gained at Hazelton, the head of navigation on that waterway and a Hudson Bay post. The line follows the course of the Skeena to the seaboard. In passing to the coast the railroad crosses a region where experiments in fruit culture have proven very promising and it is possible that the Skeena River country will rival the famous Okanagan and Kootenay valleys in southern British Columbia.

The terminus of the road is at Prince Rupert, a natural land-locked bay having an entrance from the broad Pacific a mile in width, with a harbor 11 miles in length.

My own conclusions from an examination of the country is that the center of industrial, commercial, and agricultural activity will move for the most part from southern British Columbia to the north, where the soil is richer, the climatic and physical conditions more attractive, where the winters are mild, and where there is every inducement to develop diversified farming upon an extensive scale. The mineral wealth is great, and the mining regions have the advantage of being in close proximity to farming lands, thus cheapening food supplies.

THE FORCE OF GRAVITY AND METHODS OF MEASURING IT

BY

C. H. SWICK

Coast and Geodetic Survey, Washington, D.C.

In 1665, while watching an apple fall from a tree in his garden, Sir Isaac Newton had the first conception of his great discovery, the law of universal gravitation. He soon after advanced the theory that the attraction between any two bodies in the universe is directly proportional to their masses and inversely proportional to the square of the distance between them, and he afterward proved this theory by computing the attraction between the earth and the moon.

The variation of the force of gravity at different places on the earth was first discovered by Richer in 1672. He transported a

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clock pendulum from Paris, France, to Cayenne, South America, and not only found the force of gravity to be different at the two places but also found a progressive increase in its intensity from the equator toward the poles. Using this fact as an experimental basis, Newton demonstrated the earth to be not a true sphere but more nearly an oblate spheroid, it being considerably flattened at the poles. It was not until 1743, however, that formulæ were derived, by Clairault, for computing the true form of the earth from observed values of gravity in different latitudes. The need and importance of gravity observations were then realized for the first time.

Early in the Nineteenth Century experiments were begun separately by France and England to determine the exact form of the earth from gravity observations. The force of gravity was determined at several stations along the meridian in France and at other stations in Great Britain. The attempt to compute the form of the earth from these determinations, however, was a failure, for gravity was found not to vary directly with the latitude, as had been supposed, but to have other variations due to the elevation of the station and to the topography surrounding it. To overcome these difficulties it was then decided to extend the series of stations to the equator on the one side and to the highest accessible latitudes of the northern hemisphere on the other, the stations being so selected as to eliminate as far as possible the effects of elevation and topography. These additional stations were occupied by Sabine in 1822. The results were more satisfactory this time and when computed gave fairly consistent values for the form of the earth.

Many gravity stations have been occupied since that time in nearly all parts of the world, and for several reasons these determinations have been important and necessary. Gravity observations give means for obtaining accurate, absolute standards of length and weight, and many useful inferences can be drawn from them regarding the geologic constitution and the condition of equilibrium of the earth's crust. As more stations are occupied, more accurate values of the form of the earth can be computed, and much can be learned regarding the effect of mountain masses in deflecting the plumb line.

Richer's discovery of the difference in gravity between Paris and Cayenne was made accidentally in transporting a clock from one place to the other. His clock, which kept accurate time at Paris, continually lost two seconds daily at Cayenne. In the experiments which followed Richer's discovery the pendulum was found to be not only the most convenient but also the most accurate method of

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determining the force of gravity, and it has been used since, almost exclusively, for such determinations.

At first, the pendulums used were rather crude, and were kept in motion by clockwork. As soon as it was realized, however, that the results must be very accurate to be of value, improved forms of the pendulum were developed whose lengths could be made very stable. These were swung in the open air and were detached, that is, were not connected with machinery of any sort to maintain their motion or register their oscillations. The effective length of these pendulums was made approximately one meter and the period of oscillation was about one second. Some were made adjustable and could be regulated in length to beat seconds at any station. These were reversible, that is, they could be swung with either end up, and their effective lengths at any given station were readily measured, being the distance between the two points of suspension after the pendulums had been adjusted to beat seconds with either end up. Other forms were made rigid and non-adjustable and the force of gravity at any station was obtained by measuring their periods of oscillation

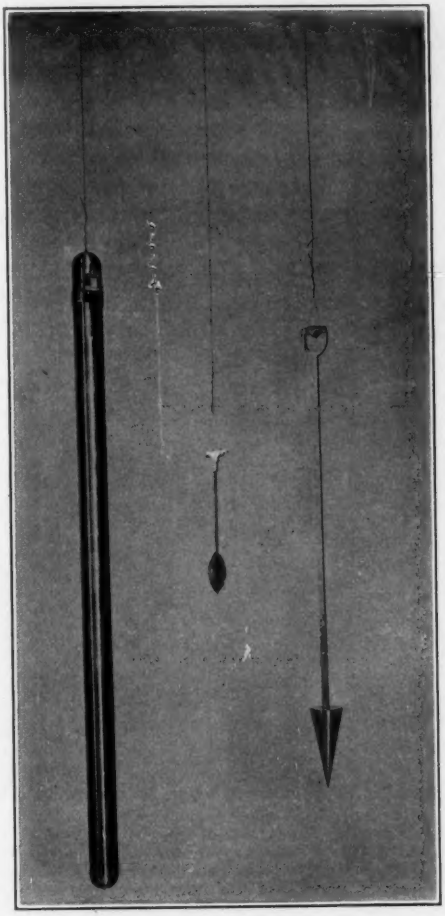

FIG. 1—Two old forms of meter pendulums compared with the quarter-meter pendulum in present use. The one at the left is known as the Pierce Invariable pendulum, the one at the right as the Kater Invariable pendulum, and the one at the center is the quarter-meter pendulum.

at that station and comparing these with their known periods at some base station where gravity had been determined absolutely with the reversible pendulum.

All of these early forms of the pendulum were large, over a meter long, and were difficult to handle and use. Considerable preparation was necessary at each station before they could be swung and the cost per station was very high as compared to the cost with present-day instruments and methods.

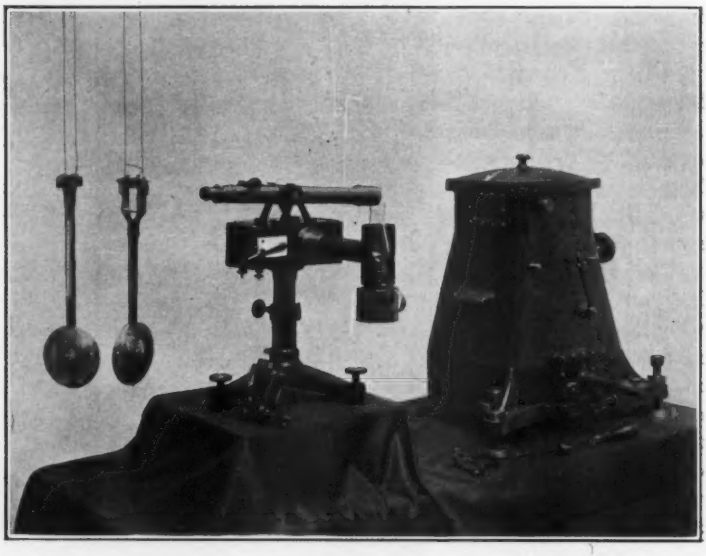

FIG. 2—Gravity apparatus of the Coast and Geodetic Survey in use at the present time. At the left are shown two quarter-meter pendulums, one of which is a stationary "dummy" containing a thermometer. The telescope used for observing the oscillations of the pendulum is shown at the center and at the right is the air-tight brass case in which the pendulums are swung.

The form of pendulum now used by the Coast and Geodetic Survey differs very materially from the early forms and was designed and constructed by members of the Survey about 20 years ago. Like the pendulum designed by Dr. R. von Sterneck in Austria several years previous to this time, it is only one-quarter of a meter long, having been designed for a period of oscillation of about one-half second. The decrease in length of pendulum made a great difference in the size and weight of the accompanying apparatus and decreased very considerably the necessary preparation at a station.

Another step in advance made at this time was in substituting a chronometer for the sidereal clock which had been previously used in obtaining the period of oscillation of the pendulum. In spite of these changes, however, the necessary equipment or apparatus for measuring gravity at a station, when packed for shipment, still weighs more than half a ton, and the packing and transporting of it requires much work and great care.

The gravity outfit in present use in the Survey consists of the following essential parts: Three pendulums, an air-tight brass case in which the pendulums are swung, a telescope for observing the oscillation of the pendulums, two chronometers, an astronomical transit, a chronograph, several thermometers, a manometer, and an interferometer, an instrument for measuring the movement of the case caused by the swinging pendulum.

The method of procedure at a station is as follows: The corrections of the chronometers to the nearest hundredth of a second are first obtained by star observations with the transit; then the pendulums are started and observed every 4 hours for 48 hours, each one of the three pendulums being used for 16 hours. At the end of the swinging, another set of star observations is made by which a second correction of the chronometers is obtained and the rates of the chronometers are then computed. The observed periods of oscillation of the pendulums are corrected for this rate of the chronometers to give their true periods of oscillation.

The pendulum is a simple stem and bob of solid brass, cast in one piece, and differs from an ordinary clock pendulum, in having a small agate plane attached to its head, which rests on an agate knife edge in the case, and in not being connected with any machinery to drive it or count its oscillations. The case in which the pendulums are swung has the air exhausted from it during the experiment to less than one-tenth of atmospheric pressure. The resistance of the rarified air and the friction between the knife edge and plane are so small that a pendulum will swing continuously for more than 8 hours even though its initial arc is only about one-fifth of an inch.

The oscillation of the pendulum is observed and compared with the beat of the chronometers at the beginning, middle and end of each 8-hour swing, and from these comparisons the average period of oscillation of the pendulum is computed.

The resulting value of gravity at a station, to be acceptable, must not have a probable error of more than one part in 200000. An actual error of one part in 200000 corresponds to an error of only one one-millionth of a second in the period of oscillation of the pen-

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dulum. Such accuracy is almost inconceivable, but it is attained with very little difficulty if the observer is accurate and careful. Care is taken to keep the pendulum apparatus at as nearly a constant temperature as is possible and any changes of temperature are carefully observed.

One of the corrections which must be applied to the observed time of oscillation of the pendulum is due to the movement of the case resulting from the swinging of the pendulum. The case is a rectangular brass box about 10 inches square at the base and 15 inches high (inside dimensions), weighing 100 lbs. It is either placed on a solid

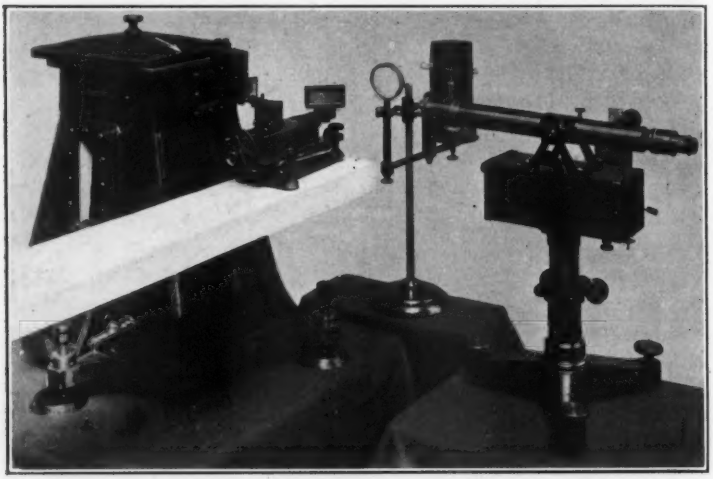

FIG. 3—Interferometer apparatus arranged for observing the movement of the case due to the swinging pendulum. The interferometer is shown resting on the end of the wooden beam at the center of the picture.

concrete floor or a special brick or concrete pier is built for it. In spite of these precautions, the swinging of the pendulum through its very small arc causes a rocking of the case, and this in turn effects the period of the pendulum. This small movement of the case is measured by the interferometer, a very delicate instrument which depends in principle upon the interference of light waves. With it distances as small as one ten-millionth of an inch can be measured. Vibrations of the ground due to the passing of a team a city block away or a train a mile away are easily detected, and, in fact, they so disturb the instrument that observations are usually possible only at night, when everything is quiet. The shaking of the ground due

to the passing of teams and other disturbing causes, while it has considerable effect on the interferometer, does not have an appreciable effect on the average period of oscillation of the pendulums. The movement of the case due to the oscillation of the pendulum, however, always has a negative effect on the period, that is, it causes the pendulum to beat a trifle slower than if the case were perfectly rigid.

There are 124 stations in the United States at which the force of gravity has been determined. About two-thirds of these have been occupied during the last three years. All determinations are made by the relative method, that is, the force of gravity at a station is obtained by measuring the periods of oscillation of the pendulums and comparing these with the known periods of the pendulums at the base station in Washington, D. C. The value of gravity at Washington was obtained in a similar manner several years ago by using Potsdam, Germany, as the base station where the force of gravity was known from absolute determinations covering many years.

A gravity party consists of two observers. A week or ten days is the usual time spent at a station, but in case of bad weather two weeks or even longer are sometimes necessary for the work. As all the observed values in the field depend upon the periods of the pendulums at the base station, the pendulums are brought back to Washington at least twice a year and tested to see that their periods have not changed or, if they have, to ascertain the amount of the change.

An interesting report on a new method of computing the effect of topography upon the intensity of gravity at a station has been prepared by the Coast and Geodetic Survey, and it will be available for distribution in the very near future.

THE CROCKER LAND EXPEDITION

About July 20 this year Mr. George Borup, Assistant Curator of Geology in the American Museum of Natural History, and Mr. Donald B. MacMillan expect to leave Sidney, Cape Breton, on a special steamer for the Smith Sound region to engage for two years in Arctic researches of great interest. The American Museum of Natural History and the American Geographical Society have approved the plans of these men and will give their support to the enterprise. Yale University and other institutions and individuals

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will also cooperate. The objects of the expedition are to reach and map Crocker Land, in the North Polar Sea, northwest of Grant Land, and to make all the scientific studies *en route* and in other parts of the Arctic regions that circumstances may permit.

The explorer Peary on June 30, 1906, stood on the summit of Cape Thomas Hubbard, the most northern point of Axel Heiberg Land, and what he saw he thus records in his book "Nearest the Pole":

"The clear day greatly favored my work in taking a round of angles and with the glasses I could make out, apparently a little more distinctly, the snow-clad summits of the distant land in the northwest above the ice horizon."

This appearance of land had been observed a few days before by Peary and his Eskimos from the northern shore of Grant Land and particularly from the top of Cape Colgate, 2,000 feet above sea level. Peary thought it was at about 100° W. Long. and 83° N. Lat., or about 130 miles from Cape Thomas Hubbard. Peary gave it the name of Crocker Land, in honor of the late Mr. George Crocker, of the Peary Arctic Club.

Dr. R. A. Harris, the well-known tidal expert, of the U. S. Coast and Geodetic Survey, based on a plot of all known tidal observations ("Arctic Tides, 1911") the deduction that a great area of land or an archipelago, or very shallow water, trapezoidal in outline and half a million square miles in superficies, exists north of western America and eastern Siberia, and stated his belief that the Crocker Land observed by Peary was part of its eastern edge.

In the Polar regions, however, great ice masses have sometimes been mistaken for land. It remains for the Crocker Land Expedition to show whether this land really exists. But there are questions of even greater importance than this to the solution of which the explorers will give much attention.

Dr. Nansen, in an article on "North Polar Problems" (1907), said: "The determination of the extent of the continental shelf to the north of Axel Heiberg Land and Ellesmere Land would be a great achievement. . . . A satisfactory solution of this problem would be of more scientific value than even the attainment of the Pole. . . . The extent and shape of the polar continental shelf, which means the real continental mass, is the great feature of north polar geography which is of much more importance, geographically or geomorphologically, than the possible occurrence of unknown islands on this shelf."

The expedition will take soundings to and from Crocker Land

and will endeavor to ascertain the position of the continental shelf in that region.

The leaders will take with them a competent physician, a cook, and probably one other man. Both Borup and MacMillan are very well known to the public through the work they did under Peary in his last Polar expedition; and they have the Admiral's unqualified endorsement of the work they are about to undertake.

The accompanying map* shows Bache Peninsula on whose southern shore (Flagler Bay) it is proposed to erect in August, 1912, the headquarters of the expedition. On the way north whale and walrus meat, and dogs will be collected. Here is a brief outline of the further movements of the party:

After sending the ship home the party, about the middle of September, will begin sledging supplies to Cape Thomas Hubbard, carrying the work on through the winter during the moonlight periods. Leaving Cape Thomas Hubbard with the return of dawn in February, 1913, they will push across the ice to Crocker Land. They will leave Crocker Land about May 1, and return to Cape Thomas Hubbard, whence they will send a messenger to North Star Bay with the news of the expedition, to be forwarded home by Danish steamer. They will then carry on scientific work in Grant Land and along the return route to winter quarters on Flagler Bay, arriving there in July, 1913. During the summer, supplies and collections will be transferred to Etah. In the spring and summer of 1914, an expedition will be made from Whale Sound (Inglefield Gulf) directly eastward to the summit of the ice-cap of Greenland, at the widest part of that island. The party will return to New York in the autumn of 1914 by special ship.

The scientific studies proposed are comprehensive. From Flagler Bay to Cape Thomas Hubbard (some 330 miles through Ellesmere, Axel Heiberg and Grant Lands), continuous geological, paleontological and physiographic work will be done and specimens collected. From Cape Thomas Hubbard to Crocker Land, in addition to the soundings already mentioned, tidal observation, temperature observation at various depths in the water and collections of marine animals will be made. On Crocker Land, two months will be spent, mapping topographically and geologically the coast line and interior, and collecting specimens of rocks and fossils and of living plants and animals. A thorough study of glaciers, glacial ice-caps and glacial motion will be made, for the purpose of solving the problem of the process of land molding under a continuous, moving ice-cap, a

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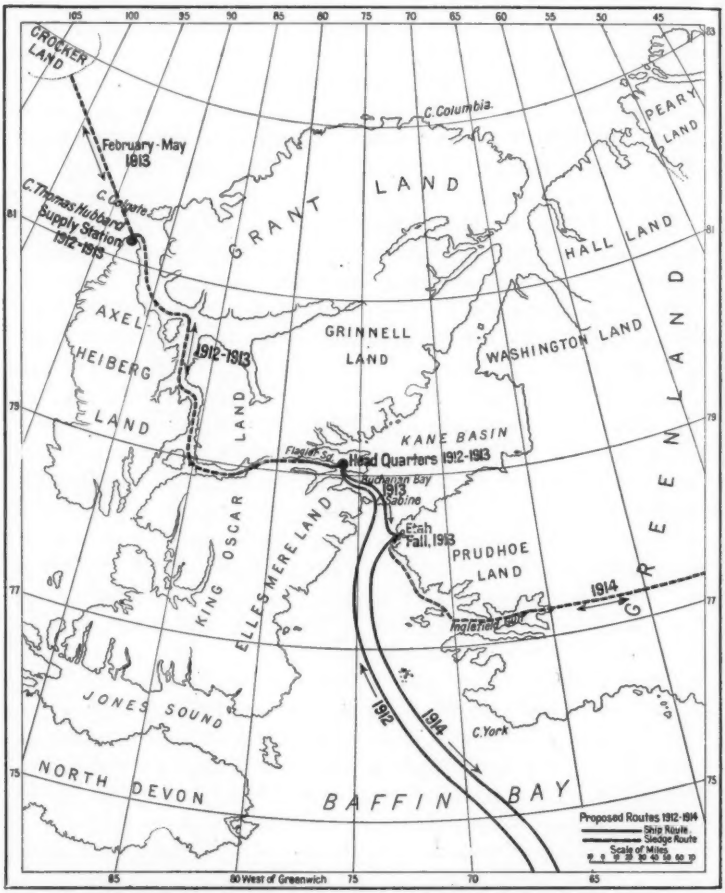
process which is not yet understood. The "glacial fringe" off the north coast of Grant Land offers a particularly interesting field for study. Attention will be paid to meteorology, ethnology, archæology, birds, mammals and fishes.



Map showing Proposed Route of the Crocker Land Expedition. Scale 1:8,500,000.

The following are some of the principal items of the outfit to be provided: three years' provisions for four or five white men, their helpers and their dogs, much of which, particularly the pemmican, has to be specially prepared and packed; clothing; instruments for

all kinds of observations and records; photographic cameras, including those for moving pictures; a power boat for use in Flagler Bay and in crossing to Etah; salary of physician and wages of cook and helpers; a steamship to take the party to Flagler Bay in 1912 and another to go up for it in 1914.

It is estimated that not less than fifty thousand dollars* must be provided for the absolute needs of the expedition, in order to enable it to accomplish the valuable results that have been outlined above, and this in spite of the fact that Messrs. Borup and MacMillan generously serve the expedition without salary during the period of its absence from New York.

In addition to the appropriations made by the Museum and the Geographical Society, subscriptions have already been made or promised by Yale University, Bowdoin College, the New York Academy of Sciences, Worcester Academy and Groton School, and by the following individuals: General Thomas H. Hubbard, Admiral R. E. Peary, Mrs. C. B. Alexander, Zenas Crane, John E. Thayer, Theodore Roosevelt, Mrs. G. B. French, Harry E. Converse, Andrew G. Weeks, Richard S. Dow, Herbert Austen, Robert P. Simpson, John Larkin, E. W. Clark, L. H. Greenwood, J. Sanford Barnes, Jr., Paul B. Morgan, Samuel Rea, W. W. Atterbury and Lewis A. Platt.

The honorary committee on the Crocker Land expedition consists of Henry Fairfield Osborn, president of the American Museum of Natural History; Chandler Robbins, chairman of the Council of the American Geographical Society, and Thomas H. Hubbard, president of the Peary Arctic Club. The committee in charge comprises, E. O. Hovey, American Museum of Natural History, and H. L. Bridgman, Peary Arctic Club.

* There remain to be raised about $30,000, and the Museum has opened an account, known as the "Crocker Land Expedition Fund," for the purpose of receiving and caring for all subscriptions made to the expedition. Checks to further its purpose should be drawn payable to the American Museum of Natural History and forwarded to E. O. Hovey of the Crocker Land Expedition Committee, to whom, furthermore, all correspondence relating to the expedition should be addressed.

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MAPS AND MAP-MAKING*

BY

CYRUS C. ADAMS

Map-makng is very old, and has been practised by the most primitive peoples for many ages. Rude scratches on many rocks in South America are now interpreted as maps. East Greenland natives carve maps out of wood; American Indians make map-sketches on birch and other barks; the Marshall Islanders charted the sailing routes along their coasts long before they knew of the white man; the desert nomad sketches maps in the sand to illustrate his wanderings, and nearly every primitive tribe to-day makes maps to show routes to hunting-grounds, animal paths, fisheries, fords, etc. They know as well as we do that maps are practically a human necessity; but we know further that a good map often places before our eyes an amount of accurate geographical information that might take many months to dig out of books. We may cite a map of Africa, now over twenty years old, the largest of that continent produced up to 1890. Hermann Habenicht, the compiler, ransacked the literature of African exploration to find what each traveler wrote about the nature of the regions along his route; and the map showed these routes, and marked along them the forest, grassy, sandy, or tillable stretches, the water resources, native settlements, and much other information gleaned by pioneer explorers. The map was a time-saver for students, a fine epitome of some phases of the work done by many men over a long series of years. The leading geographers use the perfected map of to-day as much as they do books, and often more. Dr. Hermann Wagner, for example, has said that maps were his largest dependence in the production of his great *Lehrbuch der Geographie.*

But though map-making is very old, the kinds of maps most useful now have not very long been made. The atlases of a century ago did not contain a tithe of the information now expressed on atlas-sheets. Two generations ago the maps used in European schools gave little more than a few geographical outlines, such as coasts, political boundaries, rivers, and place names; sometimes a few

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scratches to represent mountains, but not always. It was only sixty-three years ago that Emil Sydow published in Germany the first edition of his school atlas, in which he introduced the revolutionary idea that school maps should tell children something more of geography than the positions of coasts, waters, towns, and boundaries. Maps should picture as well the mountains, valleys, and plains. Cartographic expression should be given to the land forms, and maps should help the teacher to show what the surface of the earth is really like.

This fundamental idea has ever since been steadily developing. Map symbolism has wonderfully grown, till it is to-day fully adequate for the graphic expression of a large variety of facts; and, best of all, the European map-makers, by their use of contours of elevation, hachures, colors, and light and shade effects, have so perfected methods of showing the diverse forms of the earth's surface that even on a small-scale map of the Swiss Alps, for example, we may see before us the wonderful complex of high mountains, deep valleys, snow-fields, and glaciers. We may see the birth-place of the Rhine, whose glacial brooklets issue from an ice mass high up on the slopes; the little lake perched far above the valley in a small depression filled by the melting ice of the great Rhone glacier. These atlas-sheets are small, and nature is large; but the fine art of generalizing land forms has been so perfected by European cartographers that, though a great many details must be omitted, still the essentials of form are preserved, so that he who knows how to read maps may easily find the essential truth in the map picture.

The scientific map, so faithfully depicting the manifold aspects of the earth, has helped us to an interesting discovery. We know now that while the great object of geography is to describe the earth's surface, language alone is insufficient for this purpose. Only in the most general terms can speech draw a picture of the face of the earth. If we go into detail and try in words to give a complete description, the picture is vague and the mind cannot fully grasp it. The geographical description must always be associated with the map picture in order to impress upon the mind a clear and orderly idea of the various phases of the earth's surface.

Naturally, a fine map cannot give its greatest service to the man who does not know how to read it. Unfortunately map-reading is taught very little in our own schools; and the first-class map material that alone supplies the wide range of geographical facts, accurately and clearly expressed for the student's map study, is not often seen in our class-rooms. The result is that as a nation we

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are not skilful map-readers. Several years ago our government topographic survey completed eight sheets, embracing most of the Catskill Mountain region. Here was an opportunity to use these map-sheets of a bit of our country, embracing considerable variety of topographic form, to show how finely all this information might be generalized on a map-sheet of ordinary atlas size. It would be an object-lesson to our people, most of whom seldom see the mother-maps produced by our Government Survey. It would show the hundred thousand or more summer sojourners who annually visit the Catskills how much and how varied is the information that can be truthfully and clearly expressed on a small-scale atlas-sheet.

The American Geographical Society decided to have such a map made by one of the most famous map-houses of Germany. It was sold at cost price, just to demonstrate what beautiful and useful maps we shall have of our own country when we are able ourselves to apply the perfected methods of the cartographic art to the production of good, true, small-scale maps, generalized from the large-scale sheets that our government supplies. It is one of the finest maps of any part of our country. But it has made little impression upon the thousands who use Catskill maps, because so many are accustomed to look to a map only for guidance as to the position of towns and the routes leading to them. Here is a map not limited by such meager detail, but showing not only what the tourist first asks for, but also the hills, valleys, and level stretches in correct proportions and forms. A little careful attention shows approximately the grade of the roads and helps the consultant to figure out how far he can drive and get back to dinner. But though every feature of this beautiful map picture is sharply legible and full of meaning to him who can read a good map, it is to many persons overcrowded and bewildering. It gives them something of the impression that most of us have if we look at a page of Burmese print. How can such a jumble of funny-looking characters mean anything? We cannot read them, that's all.

If we Americans had been taught in school to appreciate and read the best maps, we should not be content with picture maps illustrating theaters of war, as, for example, the map of the strait in which Admiral Togo defeated the Russian fleet, with every war-ship, according to the map scale, at least fifty miles long.

The statement above, that the Catskill map is based upon sheets of our topographic survey, illustrates the two great classes of maps. Topographic surveys originated in Europe, and were meant especially to serve military purposes. It is very important in military

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operations to know the forms of the land, for as hostile armies approach each other each commander seeks to establish his forces in the most advantageous position for battle. So every important state in Europe organized topographic surveys, and methods were devised for surveying and establishing the elevation and forms of land surfaces. These methods, in time, were highly perfected, all governments use them to-day, and the resulting map-sheets give a close approximation to the actual forms of the earth's surface. We may thank this military impulse for serving so well the highest interests of geography, for these topographic sheets are now the basis of all our most accurate mapping. These detailed maps are, of course, on a large scale, and if well done they show as completely as possible the various features of the small area each includes.

It is different with the small or generalized maps such as the Catskill sheet, on which the great public chiefly depends. If they are maps of high quality they must be based upon the topographic-survey sheets as far as the territory they cover has been topographically mapped. It is interesting to note that while the basis of the generalized map is the topographic map, that of the topographic map is the ground itself. The greatest difficulties of scientific map-making lie in the generalization of these small or atlas sheets. When they show the whole world, or large parts of the earth, very little detail can be given; and in the making of all of these maps the decision of many questions, such as what to use and what to omit or how to generalize without sacrificing all characteristic essence, call for the highest qualities of scientific judgment and technical skill. This fine art of map generalization has been highly developed in most European countries, but as yet it has received little attention from our own map-makers.

Where no topographic surveys have been made the generalized map shows, in white, regions of which we have no knowledge. The delineation of partly known regions is controlled by critical use of all the available data. Accuracy in this case cannot be attained, but such knowledge as we have must be recorded; and it is even permissible to make some deductions as to the geographical features of the unknown if made by those whose theories are worth attention, and recorded on the map not as fact, but as tentative suggestion. Something of this sort has been done on the colored contour map of the United States published by our Geological Survey and showing various elevations of the surface. A large part of this great area has not yet been topographically surveyed, and many of the contours of elevation on the map are therefore tentative; but all

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considerations have been taken into account to fix the probable value of the contours, and very likely they are not far out of the way.

The effect of increased knowledge is usually to enlarge the scale of generalized maps. Twenty years ago all that was known of the geography of German East Africa might clearly be recorded on a small part of an average atlas-sheet. But hundreds of important geographical facts, such, for example, as the distribution of mineral locations, have since been discovered, with the result that no map of very small scale can now record the information at hand concerning this German colony.

Generalized maps of most European countries on a comparatively large scale are now common, and not a few of them are superb examples of map-making, in which scientific treatment of all geographical phenomena is combined with artistic presentation of the facts. Such maps are a source of great pleasure to the advanced student of geography. Thoroughly based on the principles of scientific cartography, they are works of art as well. One of the most conspicuous among them is Vogel's famous map of Germany in twenty-seven sheets. It cannot embrace all the detail of the topographic sheets, but every fact essential to most map-readers is there. Geographers always love to travel with a fine map in their hands, even when more or less familiar with the regions through which they are passing. The late Professor von Richthofen, of Berlin, said that he never made a railroad journey in Germany without Vogel's map before him. The Germans have devised a new railroad folder which is a delight to all who love to study good maps. It consists of sections of the Vogel map, showing the country for a considerable distance on both sides of all the important routes of travel in Germany. Crossing a little stream, you can see at a glance where it rises, to what larger stream it is tributary, and whether it is likely to be of industrial importance. Passing through the mountains, you can tell what lies beyond the range of vision from the car-window. This is a pastime and also a pleasant way of increasing one's geographical knowledge.

The use of color on maps has now been reduced by the best map-makers to a logical system. Not very long ago we saw on our own maps of the United States each State differentiated from those around it by a covering of color. A tint along the boundaries would have answered every purpose and left opportunity to use colors throughout the sheet as part of the scheme of symbols. Many map colors are now copied directly from nature, and often those selected are particularly appropriate, as, for example, the common use of

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blues for rainfall maps, the deepening blues of the sea as depths increase, the deepening buffs and browns as the heights of the land augment, the yellow tints for arid and sandy regions, and greens largely used on maps dealing with plant geography. The map-makers of the leading nations are approaching one another more and more nearly in their use of map colors; and for public convenience it is hoped that some day we shall see a uniform system of colors in all map symbolism. Such questions as these are sometimes settled by scientific bodies, as was the case when the Geological Congress at Bologna, in 1881, selected the colors to be applied to the International Geological Map of Europe.

A lesson we have yet to learn at home is that a good map cannot be made in a hurry. Most orders received by our map-making houses are accompanied by demands to hasten the work. The fact is that, even if a map is drawn with the utmost deliberation, errors will creep in. There is no such thing as a perfect map. A wrong stroke of the brush or pen, the slightest carelessness, may vitiate the delineation of the fact to be expressed. What possibility is there that a careful, truthful map may be produced when the demand from the map trade for high speed in performance is so pressing that craftsmen have actually been paid higher wages for manual dexterity than for competency to make a really good map? If many of our commercial map products are of low grade, it is due not only to poor technical and mechanical equipment, but also to the clamorous and incessant pressure of the man who wants the plates. The technical requirements of a good modern map are very great. In Germany a single map-sheet is often in course of preparation for many months. In the British Ordnance Survey the utmost that is expected of some of the workmen is the completion of a square inch of map-work in a day. None of the important map firms of Germany will accept a hurry order. The day is coming when our map-makers will not be compelled, at fever heat, to run a race against time.

The topographic survey-sheets of our Geological Survey and the charts of our Coast and Geodetic Survey are unexcelled by those of any other nation. In other words, we hold our own in the production of base or mother maps. But we fall short in the quality of our generalized or atlas maps. The making of such maps is the highest cartographic test, for they require the most talent and attainment. As the topographer makes his map-sketch in the field, he is producing nothing more than a reduced copy of the ground he is mapping. No imagination, no selection or discrimination is allowed.

He has the object before him, and with the appliances and methods provided he must produce faithfully the facts of nature. But the man who makes a generalized map relies not merely on objective facts, but he must eliminate all the lesser facts and interpret the others in such a manner that in outline and aspect they will be true to nature, though stripped of many of their characteristics. The faculty of doing this in a superior manner is inborn. Cultivation alone will not give it.

But we have not advanced so far in the art of map generalization as to have raised and trained a body of art-cartographers who possess this talent. We have not provided the facilities for training young men for this cartographic mission. The result is that nearly all of the European countries and even Japan are now producing better general atlases than are published in our country. It is not the fault of our few map houses that their products have not reached higher standards of excellence. Good maps cost more than poor ones; and as our system of geographical education has not, on the whole, familiarized students with high-grade maps, they lack appreciation, and there is little demand for them. In many European universities, students of geography are drilled both in the technical and the logical aspects of cartography; but our facilities are still inadequate for instruction in map logic and in the technical features of map production. Many of our maps are more pleasing in appearance than they were twenty years ago, but a map may be made more agreeable to the eye without adding to its scientific value; all our map students agree that in this greatest essential there is room for much improvement.

This situation will not last. Twenty-five years ago the standard of map-making in Great Britain was scarcely higher than it is in our country to-day. But in the course of years the influence of the geographical societies and of the universities in which chairs of Geography had been established brought about some public demand for better quality in maps; and this campaign of map criticism and of stimulation to raise the standard helped conspicuously to bring about a marked improvement in the map products of that kingdom.

An illustration may be given here of the fact that the demand for better maps is growing in our country. Two years ago one of our geographical societies formed a collection of many of the best wall maps and atlases used in several European countries. The collection has been loaned to about twenty universities, colleges, and normal schools, has traveled from the Atlantic to the Pacific, and has engagements for a year to come. The question of map improve-

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ment is becoming a live one; and we may expect that the one-millionth map of the world, in whose production all of the great map-making nations have a part, illustrating, as it will, the best phases of the cartographic art, will be potent in its influence upon our general map products.

THE SOCIETY'S TRANSCONTINENTAL EXCURSION

To celebrate the sixtieth anniversary of its founding, and the first of the occupation of the new building which has been presented to it, the American Geographical Society of New York has planned a Transcontinental Excursion which is to be managed and conducted by Professor William Morris Davis of Harvard University. The Excursion will start from New York about August 15 and will end at New York about October 15, 1912. The extreme points included in the proposed route are Seattle (and if possible San Francisco) on the Pacific coast, the Grand Canyon of the Colorado River in northern Arizona, and Chattanooga in eastern Tennessee. Many distinguished geographers of Europe, delegated by European geographical societies, will take part in the excursion, and the occasion will afford them abundant opportunity to observe interesting phases of the geography of our country. The route has been planned with the design to bring into view many aspects of the land, from physiography to economic geography. Various phases of geographical science will be represented by American members of the excursion, who will, as far as possible, act as guides for the European visitors.

The provisional list of the foreign delegates thus far received, and the geographical societies which they represent, are as follows:

AUSTRIA. *k. k. Geographische Gesellschaft, Vienna.* Dr. EDUARD BRÜCKNER, Professor of Geography at the University of Vienna; Dr. FRITZ MACHATSCHEK, Privatdozent of Geography at the University of Vienna; Dr. EUGEN OBERHUMMER, Professor of Geography at the University of Vienna.

BELGIUM. *Société Royale Belge de Géographie, Brussels.* GEORGES LECOINTE, Scientific Director at the Royal Belgian Observatory, Uccle.

DENMARK. *Kongelige Danske Geografiske Selskab, Copenhagen.* Professor OLE OLUFSEN, Secretary of the Royal Danish Geographical Society, Copenhagen.

FRANCE. *Société de Géographie, Paris.* Dr. GUILLAUME GRANDIDIER, Vice-President, Commission Centrale de la Société de Géographie, Paris; EMMANUEL DE MARGERIE, Vice-President, Section of Historical and Descriptive Geography

of the Comité des Travaux Historiques et Scientifiques, Paris; ÉDOUARD-ALFRED MARTEL, late President, Commission Centrale de la Société de Géographie, Paris.

GERMANY. *Gesellschaft für Erdkunde, Berlin.* Dr. ERICH VON DRYGALSKI, Professor of Geography, University of Munich; Dr. JOSEPH PARTSCH, Geheimrat, Professor of Geography, University of Leipzig; Dr. ALBRECHT PENCK, Geheimrat, Professor of Geography, University of Berlin.

GREAT BRITAIN. *Royal Geographical Society, London.* HENRY O. BECKIT, School of Geography, University of Oxford; GEORGE G. CHISHOLM, Lecturer on Geography, University of Edinburgh. [A third delegate is to be appointed.]

HUNGARY. *Magyar Földrajzi Társaság (Hungarian Geographical Society), Budapest.* Dr. EUGENE DE CHOLNOKY, Professor of Geography at the University of Kolozsvár; Count PAUL TELEKI, Honorary Secretary-General of the Hungarian Geographical Society, Budapest.

ITALY. *Società Geografica Italiana, Rome.* Dr. OLINTO MARINELLI, Professor of Geography at the Institute of Higher Studies, Florence; Dr. DECIO VINCIGUERRA, Professor of Biology and Zoology, University of Rome.

THE NETHERLANDS. *Koninklijk Nederlandsch Aardrijkskundig Genootschap, Amsterdam.* J. F. NIERMEYER, Professor of Economic Geography, University of Utrecht; Dr. KARL OESTREICH, Professor of Physical Geography, University of Utrecht.

NORWAY. *Norske Geografiske Selskab, Christiania.* THOROLF VOGT, Geological Survey of Norway.

PORTUGAL. *Sociedade de Geographia, Lisbon.* Dr. FRANCISCO SILVA TELLES, Professor of Geography in the Faculty of Letters, University of Lisbon.

RUSSIA. *Imperatorskoye Russkoye Geograficheskoye Obshchestvo, St. Petersburg.* JULES M. SCHOKALSKY, Professor of Physical Geography at the Académie Navale Nicolas and at the École Supérieure Pédagogique, St. Petersburg.

SPAIN. *Real Sociedad Geográfica, Madrid.* Dr. RICARDO BELTRAN Y RÓZPIDE, Secretary-General of the Royal Geographical Society, Madrid.

SWEDEN. *Svenska Sällskapet för Antropologi och Geografi, Stockholm.* Dr. GUNNAR ANDERSSON, Professor of Economic Geography at the College of Commerce, University of Stockholm.

SWITZERLAND. *Geographische Gesellschaft, Bern.* JEAN BRUNHES, Professor of Geography at the Universities of Fribourg and Lausanne; ÉMILE CHAIX, Professor of Economic and Political Geography at the University of Geneva and at the School of Commerce; Dr. FRITZ NUSSBAUM, Privatedozent of Geography at the University of Bern.

The meeting in New York at the close of the Excursion will occupy two days. Foreign members of the party will be invited to make brief communications on objects that have excited their interest, and to describe European parallels to American examples. Provision will be made for the subsequent publication of the papers thus submitted.

The *Bulletin* will print later the names of additional foreign members, together with a list of American members of the Excursion.

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GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

CONGRATULATIONS TO AMUNDSEN. In behalf of the American Geographical Society this cablegram was sent to the explorer Amundsen, by President Huntington, after the announcement that he had attained the South Pole:

"NEW YORK CITY, March 11, 1912.

"ROALD AMUNDSEN, Hobart, Tasmania.

"American Geographical Society congratulates you on brilliant and well earned success. "HUNTINGTON."

MEETING OF THE SOCIETY. A regular meeting of the Society was held at the Engineering Societies' Building, No. 29 W. 39th St., on Tuesday evening, Feb. 20, 1912. Vice-President Greenough in the Chair. The following persons recommended by the Council were elected to Fellowship:

Miss Mary E. Harrington, William B. Beam.

The Chairman then introduced Mura Bayly, F.A.G.S., who addressed the Society on "New Zealand." Lantern views were shown.

NORTH AMERICA

ARIZONA A STATE. President Taft, on Feb. 14, signed the proclamation declaring Arizona to be a State of the Union. The new Commonwealth adds the forty-eighth star to the flag and brings into the sisterhood of States the last bit of territory in the United States, south of Canada.

THE NEW MADRID EARTHQUAKE. Beginning on September 16, 1811, and lasting more than a year, a succession of severe earthquake shocks known as the New Madrid Earthquake, so named from a town now standing on the Mississippi River, occurred in the Central Mississippi Valley, and extended over southeastern Missouri, northeastern Arkansas and western Kentucky and Tennessee. These shocks were not equalled in severity and continuance of disturbance by the famous earthquakes at Charleston and San Francisco. Little attention was paid to the phenomena at the time because the region contained very few white residents. In its scientific aspects, this earthquake may be regarded as a type exhibiting, in unusual detail, the geological effects of great disturbances upon unconsolidated deposits. In this sense its phenomena have much importance and it is gratifying that the U. S. Geological Survey has issued a monograph (*Bulletin* 494, 119 pp., Maps and Ills.) entitled "The New Madrid Earthquake," by Myron L. Fuller, in which the author has brought together, with great care and thoroughness, all the data he has been able to collect concerning the earthquake; and he discusses its details in the light of our present knowledge of seismology. His sources of information were "the quaint, picturesque and graphic accounts of contemporaries, and the equally striking geographical and geological records which even now may be clearly read at many points in the region."

Mr. Fuller says, with regard to the ultimate cause of the earthquake, that,

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as the center of activity of the primary shocks was within the embayment area and well removed from the surrounding area of consolidated rocks, it seems clear that the ultimate cause lies in forces operating beneath the embayment deposits. The action may be associated either with the processes of folding or warping or incident to a depression and deepening of the basin.

GEOGRAPHY AND AGRICULTURE IN WISCONSIN. In Wisconsin, where an increase of 47 per cent. in the number of cows between 1900 and 1910 was accompanied by so large a production of butter, cheese, and milk that the State now ranks first in the United States, having passed New York, in the value of dairy products, the economists interested in agricultural statistics have been applying geographical methods to the interpretation of their data. One of their reports (H. C. Taylor and C. E. Lee, "Progress of the Dairy Industry in Wisconsin", Wis. Agr. Experiment Sta. *Bull.* 210, June, 1911, pp. 1-30) is illustrated by a series of small maps of the state upon which the grouping of dots in the several counties to show the distribution of cows, hay or corn, creameries, skimming stations, condenseries, and cheese factories, enables one to read graphically the relationships of these agricultural items to the topography and climate, shown in the text in a relief map of the State and a map showing length of growing season.

The text, though mainly concerned with agricultural matters, does not neglect geography, discussing specifically, for example, the relationships of a geographical topic like the nationality of the population. The Swiss are seen from one map to be largely concentrated in one county where the combination of favorable climate, etc., with the knowledge, skill, and imported habits of the Swiss immigrants have evolved 213 cheese factories and of course a great production of Swiss cheese.

The nearness of southern Wisconsin to the Chicago market and direct transportation have naturally affected the great increase in dairy products during the last decade (70 per cent. increase in butter and 86 per cent. increase in cheese), but the maps show that this is a minor control compared with the suitability of topography, soil, and climate for the development of the dairy industry.

LAWRENCE MARTIN.

NORTHERN SELKIRK MOUNTAINS. During June and July, 1911, Mr. Howard Palmer, Secretary of the American Alpine Club, with Professors E. W. D. Holway and Frederic K. Butters of the University of Minnesota, continued his exploration of the region about Mt. Sir Sandford (51°39′ N. and 117°50′ W.) in the northern Selkirk Mts., begun in 1908 and 1909 (cf. *Appalachia,* Vol. 12, No. 1, 1909, pp. 16-30 and *Geogr. Journ.,* Vol. 37, No. 2, 1911, pp. 170-179; both with maps). Detailed investigation was made of the rates of flow and of recession of Sir Sandford Glacier, the results of which will be published as soon as possible. In addition a reconnaissance photo-topographic survey based on instrumental triangulation was made of a considerable area in the unexplored mountainous district included in the "Big Bend" of the Columbia River. The exceedingly irregular crest-line was traced for some twenty-five miles and, except for the gap discovered by Moberly in connection with the Canadian Pacific Railway surveys between 1870 and 1872, no timbered pass leading from the N. W. flowing course of the Columbia to its S. S. E. flowing section was observed. A continuous meteorologic record was kept by means of a portable barograph and minimum and black-bulb thermometers. Altitudes were estimated by aneroid barometer, checked by boiling point thermometer and barograph.

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In August the party traversed the valley of the North Fork of the Illecillewaet River to its head and continued their explorations in this vicinity. In all, eight peaks above 9,000 feet were ascended, of which seven were first ascents. The mountains along the divide are heavily glacier-laden and support several extensive névés.

THE CARIBOO MOUNTAINS. Professor J. Norman Collie, of Canada, read before the Alpine Club of London on Dec. 10 last a paper on "On the Canadian Rocky Mountains North of the Yellow Head Pass," which the Grand Trunk Pacific is now making accessible to mountaineers. The region which Prof. Collie describes will before long, undoubtedly, be popular among tourists and mountain climbers. The author says about the Cariboo Mountains, which are just coming into notice:

"We climbed a peak on the east side of the Moose Valley and away to the west beyond Tête Jaune Cache and the Fraser River, I saw for the first time the Cariboo Mountains [a little S. of 54° N. Lat. and E. of 122° W. Long.], and I was surprised to see how fine they were. From many of the Rockies further south I had seen the Selkirk range, but they are not, in my opinion, at all equal to the Cariboo group. Two especially fine peaks could be seen; a great snow field with a grand glacier coming down eastwards towards the Fraser River. This mountain land should prove a great field for the mountaineer. Up to the present, as far as I know, not a white man has ever penetrated into its fastnesses. I have heard stories of how even the most adventurous of prospectors have been turned back. This is not surprising to anyone who has had to deal with dense British Columbia forest. Huge fallen trees, thick underbrush full of that pest the devil's club, turbulent glacier streams, can render a valley quite impassable. Any one who has attempted to reach the high mountains on the west of the watershed either in the Selkirks along the Columbia River or in the Rockies, knows that he will never try again. Possibly, however, when the Grand Trunk Pacific railway has opened up the Fraser Valley, it will be possible to get men who, with two-handed saws and axes, can clear a trail, but both money and time will have to be spent before anyone will win to this magnificent group. It will, though, be well worth accomplishing, for the Cariboo Mountains are certainly as high—perhaps even higher—than the Selkirks; the peaks are finer shaped, and there are some narrow gorges (especially one to the north end of the group) that must afford grand scenery. If what is marked on McEvoy's map be true—namely, that they belong to the Archæan formation—they are certain to possess fine form, for the Archæan rock weathers into the most picturesque details."

MR. RADFORD IN NORTHERN CANADA. Mr. Harry V. Radford writes to the *Bulletin* that he arrived at Spurrell Harbor, mouth of Chesterfield Inlet, with his assistant T. George Street, on Sept. 30, finding there the promised relief supplies landed for him by the Hudson Bay Company's steamer *Pelican* in September. He expected to leave Spurrell Harbor on Oct. 4 to return up Chesterfield Inlet and go with dogs and sledges 270 miles westward to the head of Schultz Lake, where he and Street intended to winter with the Eskimos. They will try to reach the Arctic Coast in the Spring at or east of Bathurst Inlet and proceed inland.

THE GLACIAL GREAT LAKES IN CANADA. Goldthwait, to whom we owe so much of the revival of the study of the glacial Great Lakes by the introduction

of detailed instrumental surveys of their abandoned strand lines, has extended his studies, under the direction of F. B. Taylor, from Wisconsin and Michigan to the eastern shore of Lake Huron in Ontario. (Goldthwait, J. W., "An Instrumental Survey of the Shorelines of the Extinct Lakes Algonquin and Nipissing in Southwestern Ontario," Memoir No. 10, Canada Department of Mines, Geological Survey Branch, 1910, pp. 5-48). Measurements were made in 1908 with a wye-level. The Algonquin beaches vary in level at present from about 25 feet above Lake Huron near its outlet to 314 feet at the northernmost locality studied. They are horizontal at the southern end of the lakes (607 feet above sea level), as the Algonquin strands are in southern Lake Michigan, and then slope northeastward at grades of from 1.43 to 3.6 feet to the mile.

The Nipissing shoreline, 15 to 58 feet above Lake Huron, shows a similar, though less marked, deformation with horizontality in the south (596 feet above sea level) and grades of 0.11 to 0.57 feet to the mile. The remarkable agreement of results throughout a wide area around the shores of Lakes Michigan and Huron thoroughly justify the time and expense given to these detailed instrumental observations; and the determination of lack of disturbance in the southern part of the area of these glacier margin lakes makes it possible to use these elevations as planes of reference, subtracting 607 feet from the present altitude of any Algonquin beach and 596 feet from the altitude of any Nipissing beach, to determine the amount of uplift of a region since Algonquin or Nipissing time. LAWRENCE MARTIN.

SOUTH AMERICA

THE CONTINENTAL WATERSHED OF PATAGONIA. Mr. P. D. Quensel, a member of the Swedish Magellanian Expedition of 1907-1909, spent most of two summers on the eastern slopes of the Patagonian and Fugian Cordillera, chiefly occupied with petrological studies, but noting also the glacial geology of those regions to which he calls attention as offering a wide and interesting field of work. The Society has received a paper by him "On the influence of the Ice Age on the Continental Watershed of Patagonia" (Reprinted from *Bull. Geol. Instit. of Upsala.* Vol 9, pp. 60-92, 2 maps in colors, and 12 ills.), from which his principal conclusions are here summarized. His studies point to the conclusion that the ice-divide, during the ice age, generally followed the Central Cordillera range, though the present watershed, often consisting of glacial deposits, is chiefly situated to the east of the mountains, indicating the limits of the latest Cordilleran glaciation. Until towards the end of the ice age the transandine valleys must have been filled with an ice-barring outlet in that direction and the drainage of the eastern Cordillera must have followed the pre-glacial Pampean valleys to the Atlantic. On account of the slight slope of the transversal valleys the rivers have had but small erosive power and have therefore not been able to cut through the extensive glacial deposits and drain off the lakes, which were hollowed by powerful glacial erosion and are without doubt of great depth.

In preglacial time, low passes of erosion must have existed in many places in the Cordillera. Through ice accumulations in these depressions, the passes may have been lowered by glacial erosion, mighty streams of ice from the central mountains following these depressions both east and west. The western parts of the sub-andine lakes resemble the fiords of mountain regions which were once the seat of glaciation. The marked tendency of many of the fiords of the

sub-andine lakes, to stretch in a north-south direction is probably due to the tectonic depressions or faults, caused by the forming of the Cordillera range to which they are parallel.

The author draws attention to the relation between the principal sub-andine lakes and the present inland ice of Patagonia. With a break of only 60 km. a continuous field of ice covers the central Cordillera for over six degrees of latitude from the Kirk Narrows in the Ultima Esperanza district nearly to the pass of the Aisen River. Further north the general appearance of the mountain range changes; though mighty glaciers are still found, the glaciation is of a more local character and confined to the highest mountains. All the large sub-andine lakes are found in the region of the inland ice. All the trans-andine passes of the southern regions have their source from sub-andine lakes, whereas, further north, though the general system is the same, the lakes have been drained off. Even during the glacial period there was evidently a much more limited glaciation in the Cordillera between Nahuel Huapi and Aisen than further to the south, which led to decided differences in the orography of the present day.

Miss Annie Peck's Latest Ascent. Miss Peck, who has recently returned from South America, sends to the *Bulletin* this note on her latest ascent:

"I made, last summer, the first ascent of the mountain massif Coropuna, in the coast range of Southern Peru, from the town of Viraco on the south slope. I ascended two peaks, the only ones visible from that side. From their summits, I saw several more farther back, but as there was a gulf between and as it was evident from my hypsometric observations that the elevation of the mountain on which I stood was less than that of Huascarán, I thought it hardly worth while to attempt the others with my very limited resources. I had no Swiss guides and was much pleased at being able to make the ascent on the first trial. Of course, it was far less difficult than Huascarán.

"My companions on the summit of Coropuna were Señor Ricardo Carpio, Peruvian, Mr. Carl Volkmar, German-American, and four Peruvian porters, seven of us altogether."

AFRICA

Rhodesia. The report of the British South Africa Company for the year ending March 31, 1911, announces that the two territories hitherto known as Northeastern and Northwestern Rhodesia will hereafter be administered as one territory under the name of Northern Rhodesia. The progress in farming and ranching in Northern Rhodesia gives much promise for the future of these industries. A large area is suitable for cotton and the prospects of cattle raising are excellent. The rapid development of the mineral district in Katanga, Belgian Congo, has made a good market for all kinds of farm produce, and Rhodesian farmers are now able to reach this market by the extension of the Rhodesian railroad to Elizabethville in this mining region. In the whole of Rhodesia the European population has increased by more than 87 per cent. since the census of 1904. In the past year, 330,000 acres of land were sold, the gold output was $13,239,480, the net receipts of the railroads showed an increase of $1,270,000, and the gross imports, an increase of $2,850,000 over the previous year.

Cotton Growing in Northern Nigeria. The Governor of Northern Nigeria says in the *Annual Report* on the Protectorate for the year ending March 31, 1911, that strenuous efforts are being made to encourage the natives to grow

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cotton on a large scale. Experimental plots have been established at various centers. As soon as the natives begin to realize that cotton is a crop for which there is always a ready sale to an unlimited extent they will embark largely in its cultivation. The Governor believes that, under proper guidance, there will be a steady and continuous increase of production. The people have for centuries grown cotton and have little to learn as regards methods of cultivation. The present problem is the improvement of the local varieties of cotton and the discovery of the means to increase the productivity of the plants. He thinks that the prospects of cotton growing on a large scale are especially promising in the fertile lands bordering on the Niger and Benue.

ASIA

THE NEW CAPITAL OF INDIA. *The London Times* (Weekly edition, Feb. 9, 1912), says that Parliament will be asked to give statutory authority to the Government of India Bill which will declare Delhi to be the capital of India and will authorize the constitution of that city and a defined area around it into an Imperial *enclave*. The *enclave* will cover an area of over 180 square miles, most of it taken from the Delhi Division of the Punjab.

THE METRIC SYSTEM IN JAPAN. The Decimal Association, Great Britain, announces that the King of Siam, on Nov. 15 last, ordered the adoption of the metric system throughout that kingdom. The Siamese authorities have taken steps to procure from the Bureau Internationale des Poids et Mésures, in France, standards and prototypes for furnishing a Central Office of Weights and Measures in the kingdom. The system will be introduced in about a year and, twelve months later, the law will be enforced throughout Siam.

AUSTRALASIA AND OCEANIA

MATAVANU VOLCANO QUIESCENT. Dr. K. Sapper reports (*Zeitsch. Gesell. f. Erdk. zu Berlin*, 1911, No. 10, pp. 701-704) that the activity of Matavanu, in the island of Savaii, Samoa, has ceased. Dr. Grevel wrote to him, on Aug. 15, 1911, that for a month the lava flow into the sea had stopped, that a hard smooth surface covered the lava lake and further outbreaks seemed improbable. In October, Father Mennel wrote that since the end of August the volcano had the appearance of being extinct. Its activity had been gradually decreasing for about nine months, and it is deemed probable that a long period of quietude will now ensue. The outbursts began in August, 1905. A crater opened in a valley from whose outpourings a new volcano was built up to a height of 2,000 feet, obliterating the valley, which became a huge ridge about 1,500 feet high. About 30 square miles were covered with lava, the flow over a considerable area exceeding 1,000 feet in thickness. A part of the sea, between the shore and the coral reef, was filled with the ejecta. The eruptions were very violent throughout 1906, and also at various periods since then. Dr. Sapper urges that persons competent to make a careful study of the phenomena of the Matavanu eruptions should be sent to Savaii.

POLAR

ICE CONDITIONS IN THE ARCTIC SEAS IN 1911. The annual "Isforholdene i de arktiske Have" for 1911, published by the Danish Meteorological Institute, has appeared with Danish and English text in parallel columns as usual. The

data received from Bering and Beaufort Seas, Bering Strait and Kara Sea were too inadequate to give much idea of the state of the ice in those regions. There was an unusual amount of ice in the Greenland Sea and in April and May the ice boundary extended from the east coast of Iceland to the east of Jan Mayen. About June 15, however, vessels had no difficulty in reaching Angmagsalik, the Danish port in East Greenland. The five accompanying maps show the ice conditions as far as known for the months of April-August.

PHYSICAL GEOGRAPHY

THE SALINITY OF THE ATLANTIC OCEAN. That differences of salinity in different parts of the same ocean are largely due to meteorological controls has long been known. Thus, in the trade wind belts, with abundant evaporation, the salinity is greater than it is in the doldrum belt, with its heavy rainfall and cloudy skies. A recent discussion of the problem of the salinity of the oceans, by Dr. Alexander Woeikow ("Der Salzgehalt der Meere und seine Ursachen," *Pet. Mitt.*, Jan. and Feb., 1912), brings forward an interesting explanation of the differences in salinity between the three great oceans. This explanation rests largely upon meteorological controls, and in view of the thorough study which the author is known to have given to this whole subject the paper is worthy of attention.

The greater salinity of the Atlantic as compared with that of either of the other oceans, which exists in spite of the fact that the continental areas which drain into the Atlantic are larger than those in the case of the Pacific and Indian Oceans, is explained as follows: The mountain ranges bordering upon the Atlantic are neither high nor very extended. The water vapor, from evaporation over the Atlantic, is carried far into the continents, and a large part of the resulting precipitation does not return to the Atlantic. Thus, for example, in the case of Eurasia, Woeikow points out that under the influence of the upper and lower westerly winds, and also partly of that of the southerly winds, the water vapor from the Atlantic and its mediterranean seas is carried beyond the Atlantic drainage areas. In Turkestan, balloon and kite observations show the prevalence of westerly winds of considerable velocity a short distance above sea-level. This fact leads to the belief that the water vapor which is precipitated as rain or snow in the Tian Shan is derived from the Mediterranean. From the Atlantic directly there may even be a transportation of water vapor, in the anti-trades, far to the east. The Sahara, also, receives and does not give back, a supply of water from the Atlantic. The loss of water vapor thus brought about, and not compensated by an equivalent inflow of water in rivers, is thought by Woeikow to be the principal cause of the great salinity of the Atlantic. In the Pacific and Indian Oceans the weather does not find a similar loss of water vapor, owing largely to the better enclosure of these oceans by the higher altitudes of the surrounding continents. The Atlantic Ocean thus experiences a definite loss. Dr. Woeikow knows the meteorology of the Aralo-Caspian area so thoroughly that his explanation of the transportation of Atlantic water vapor into that region must be received with serious attention. It is, in the nature of the case, impossible to give any definite proof of the correctness of the theory. A map of the salinity of the oceans, of the altitudes of the continental margins, and of the drainage areas accompanies the article.

R. DEC. WARD.

OBITUARY

ARTHUR DE CLAPARÈDE. Prof. de Claparède, eleven times President since 1891 of the Geographical Society of Geneva, Switzerland, died on Dec. 13, 1911. He was born in 1852, and though never in robust health, he traveled extensively and for many years, was widely known as a writer on geographical and economic topics. He was among the leaders of the development of geographical education in Switzerland. He was President of the Ninth International Geographical Congress at Geneva in 1908 and represented Switzerland in 1904 at the Eighth Congress in the United States.

A. H. KEANE. Dr. A. H. Keane, the anthropologist, died in Hampstead, England, on Feb. 3, 1912. He was born in Cork in 1835. He was not a field worker, but his literary training and wide knowledge of languages especially fitted him for collation and synthesis. He wrote many admirable monographs and a number of books on geographical and anthropological topics. Among his best-known works are his "Ethnology" (1896), "Man Past and Present (1899), and "The World's Peoples" (1908). The usefulness of his work is largely due to the vast extent of his reading and his systematic method in arranging and presenting the observations of field students.

CORRESPONDENCE

MAP READING

To the American Geographical Society: A recent magazine article on "Maps and Map Making" refers to the little knowledge of map reading among our students and the failure to teach the subject in our schools. In supplying the U. S. Geological Survey sheets to local schools I have found them little appreciated. It is enjoyable to travel with good maps in hand; and on auto or bicycle tours at home and in England, France, Italy and Switzerland, my pleasure and profit have been much enhanced by using the excellent maps of those countries. As a traveler, I know that one sees only what his intelligence, education and training fit him to appreciate and understand. I greatly regret that our schools are so slow in taking up the subject of teaching their students how to get all the information that really good maps supply to those who can read them.

HENRY N. FRANCIS, Am. Soc. C. E.,
Providence, R. I., Feb. 23, 1912.

MOUNT TACOMA

To the American Geographical Society: I enclose a newspaper clipping relative to an application to the U. S. Geographic Board in Washington asking that the old name of Mount Tacoma be restored. It is regrettable that the old Indian name should have been taken away and replaced by that of an unknown foreigner, mainly on account of the rivalry of two cities. I was there in 1882. At that time Tacoma and Seattle were great rivals, Tacoma slightly leading in population. Everybody in Tacoma called the mountain "Tacoma," but Seattle hated the name as it was her rival's and spoke of it only as Mt. Ranier. As Seattle later became a great railroad terminus and grew to be larger than Tacoma, the name Mt. Ranier became fixed and the railroads naturally published it in their guide-books and time-tables. It has seemed to many persons wrong to take away the Indian name and I am very glad if a movement is on foot to have it restored.

WILLIAM BOERUM WETMORE,
Allenhurst, N. J., Feb. 5, 1912.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

AMERICA

The Making of a Great Canadian Railway [Grand Trunk Pacific Railway]. By Frederick A. Talbot. 349 pp. Map, ills. and index. Seeley, Service & Co., Ltd., London. 16s. 9 x 5½.

A vivid description of the organization and construction of the Grand Trunk Pacific Railway based on personal investigation by the author in 1910. Two introductory chapters are devoted to the part played by Charles M. Hays in revitalizing the Grand Trunk Railway by extending it to the Pacific. The remainder of the book deals in detail with the building of the road, the difficulties met with and how they were overcome, the experiences of the surveyors and life in the railroad camps.

Although the book is avowedly "intended for those who are interested in the romantic side of railway-building," a sufficient knowledge of geography as an element of general culture could be expected so that such statements would be impossible as those which ascribe to the "Japanese [*sic*] chinook wind" the equable climate of the northern Pacific coast (p. 35). The condemnation of the government maps (p. 50) on the ground of their inadequacy for the purposes of the railroad engineer reveals, too, a lack of appreciation of their scope. Again, although the text deals at length with the means by which the mountain barrier was overcome, the accompanying map places the Rocky Mountains along the axis of the Interior Plateau of British Columbia, in no causal relation with Mt. Robson and Yellowhead Pass, both of which are represented on the map.

Nevertheless, the book is on the whole valuable, mainly because it furnishes information, otherwise not readily available, concerning an undertaking of far-reaching importance. W. L. G. J.

The Pan American Union. Peace, Friendship, Commerce. By John Barrett, Director-General of the Pan American Union, Washington, D.C., 1911. 254 pp. Ills. $1. 8½ x 6½.

A handbook of information on the Southern republics, their resources, population, area, commerce and progress; and the work, scope and history of the Pan American Union. The book is well illustrated.

Down North on The Labrador. By Wilfred T. Grenfell. 229 pp. Ills. Fleming H. Revell Co., New York, 1911. $1. 7½ x 5.

This is a collection of sketches and stories by Dr. Grenfell. The stories are well written and entertaining, although they are open to the criticism that the characters are idealized. The book gives an admirable picture of the life along this barren coast with the constant struggle against great odds. The winter in all its severity, expeditions for relief during all kinds of weather, now

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and then a comparison with more favored conditions and above all the simple faith of these brave men and women whose lives are unending battles against the hardships of an inhospitable land and a changing sea, form the themes of most of the stories. R. M. BROWN.

AFRICA

Notre Beau Niger. Par Félix Dubois. 299 pp. Map and illustrations. E. Flammarion, Paris, 1911. 5 Fr. 8 x 5.

This is an account of fifteen years of French colonization in the Sudan and especially along the Niger River. The journey of the author began at Algiers. The first stage of his travels was across the Sahara to Gao on the Niger. The account of the author's wanderings in the desert region is reserved evidently for another volume, "L'énigme du Sahara," advertised to appear soon The second stage of the journey begins at Gao, and, after various stops along the way, ends at Bammako, far up the Niger. The author is a firm believer in the possibilities of the French Sudan, and the reader must be constantly on guard lest he be swept along by the enthusiasm of the writer and thereby expect to find in this portion of Africa the sole example of great achievement in colonization. Some of the author's extravagances may be accounted for by understanding that it seems necessary to him to overcome considerable opposition in his native land, where many have been taught that the French Sudan is one of the more refined parts of the lower regions. Dubois reports the country as yielding nothing to the Nile country in promise. In this spirit the author visits and recounts the present conditions of the towns of Gao, Kabara, Timbuktu, Mopti, Djenné and finally Bammako. In the chapter on Kabara, the port of Timbuktu, there is an account of the postal service of the country and an interesting comparison of the conditions of former journeys, replete with tragedy, from Kabara to Timbuktu and the journey to-day with all its comforts along a beautiful and comfortable highway, "le Boulevard et le Bois de Boulogne de Tombouctou." The chapters on Timbuktu describe the life there, and in dealing with the past the old account of the discovery of Timbuktu by Robert Adams is rehearsed, which the author discredits, characterizing the action of Adams as a "bluff." The volume contains, besides the details of the journey, many interesting things, such as the construction of the hotel at Kulikoro in a manner to withstand the ravages of the ants, the railroads already constructed, for which the author has excessive praise, the projected lines, an interesting account of the introduction and production of cotton and a Sudanese school. R. M. BROWN.

Erwachende Agrarländer. Nationallandwirtschaft in Ägypten und im Sudan unter englischem Einflusse. Von Siegfried Strakosch. xii and 235 pp. Map. Verlagsbuchhandlung Paul Parey, Berlin, 1910. M. 7.

The "agricultural countries in process of awakening" of which the author speaks are Egypt and the Anglo-Egyptian Sudan. He discusses the possibilities of these two countries from the point of view of what he calls *national agriculture,* that is to say, in judging the agricultural status of a country he first examines the natural conditions which the agricultural methods must meet in order to be successful, and then determines the value of those methods, not by their degree of up-to-dateness according to modern European standards but by the degree in which they are adapted to those natural conditions. Taking the plough for an example, he shows that the quasi-antediluvian instrument which the

Fellah uses answers the purpose much better than any modern plough could, and explains why such a one will probably never do on Nile soils.

Modern methods will be, on the other hand, a great factor in the further development of Egypt wherever irrigation is required, because wide tracts of the land are deserts without it, while they bear one crop every year when flooded, and two or even three crops when irrigated by means of ditches. In this respect, indeed, the country is not only behind the times but even behind its own past; for it is as good as proven that the area under cultivation was larger in the times of Old Egypt than it is now. The reason is that irrigation works require capital and a concentration of power, both of which have been lacking in Egypt for centuries, because, by virtue of a very peculiar lease system, the large landowners had taken almost no part in the cultivation of their lands, but left the care of them entirely to the Fellah tenants, who, each on his own small farm, were unable to handle such a large problem.

The Anglo-Egyptian Sudan, which extends from the second cataract to the Belgian Congo and covers about 1,000,000 square miles, is not such a homogeneous agricultural and historical unit as the Nile valley. Although it was successively under the influence of Egyptian, Christian, and Arabian culture, its agricultural system bears no trace of any of them, but is distinctly of the negroid type. The negro never rises above small farming and employs neither instruments nor cattle in tilling the soil. The author estimates that there are about twenty ploughs in the whole country north of Khartum, and exactly ten south of that place, viz. the 10 wooden ploughs bought by the government for their experiment farm on the Blue Nile. Rains are more frequent than in Egypt, but not very regular, so that the negro farmers become almost nomads by being obliged to migrate from one place to the other according to the occurrence of the rains. Others stick invariably to the same places, because they live in such strained relations with their fellow tribes that they must remain stationary in order to maintain their claim to the soil. On the whole, the population of this part of the Sudan is very scarce, and the country might support many times the actual number of inhabitants, so that the stimulus for improvement is entirely absent because there is always food enough for everybody.

The Anglo-Egyptian understanding about this part of the Sudan is a kind of symbiosis which benefits both Egypt and England. England needs the Sudan because it controls the fate of Egypt by controlling the upper Nile, and also for the sake of the Cape-to-Cairo railroad. But it would be very difficult for England sufficiently to assert her authority at such a distance from the home country, in an almost inaccessible region where neither troops nor provisions could be dispatched with any degree of promptness, and in the midst of a hostile population. Egypt is nearer, locally and historically, and it has an excellent army. The alliance with Egypt enables England, therefore, to preserve peace and order at the least possible expense, while to Egypt the organizing skill and colonial experience of England is a great help in establishing a civilized government.

In Egypt the signs of an agricultural awakening are noticeable everywhere. The irrigation works, and the area under cultivation likewise, are continually increasing, and in this process the Fellahs are proving a very valuable element. Although they cannot be called a race anthropologically, they certainly are the descendants of the farmer caste of Old Egypt who love the soil which they till, and since the reform of the tax system has improved their general economic situation, the younger generation has become less fatalistic and indifferent, less

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distrustful of innovations than it was before. The demand for fertilizer increases and the fields become more and more productive; the Fellah begins to appreciate the work of the Khedivial Society, and he sends his children to school.

The number of and interest in the schools has increased wonderfully since the British occupation. The school budget rose from £2,300 in 1881 to £450,450 in 1906, and private benefactors vie with each other in endowing institutions of learning. There are at present 4,324 Kuttabs (village schools), besides many higher primary and secondary schools, engineering schools, girls' schools, normal schools, trade schools; there is an Agricultural College at Ghizeh, and the idea of a modern national University of Egypt is gaining ground more and more rapidly.

The most meritorious body, for the agricultural development of Egypt, is the Khedivial Agricultural Society of Egypt. It was founded in 1898, as a free association of paying members, mostly farmers, which was to arrange exhibits, make experiments, encourage agricultural research, procure seeds and fertilizers, and promote the interests of the members and of agriculture in Egypt generally. It was reorganized in 1904, for the purpose of establishing branch associations, under the leadership of graduates of Ghizeh College, in all the fourteen provinces of the country. If things continue at this rate, the area under cultivation in Egypt will soon be doubled.

In the Sudan similar progress cannot be expected so soon. The problem there is not how to awaken an old civilization from a sleep of centuries but how to create a new one literally out of nothing, in a region where everything seems to conspire against it; abundance and want, each fatal to progress in its own way; climate, desert, jungle, disease; enormous distances, lack of roads, sparsity of population. The thorough knowledge of these conditions is the first prerequisite to any attempts at cultivation, and therefore the work of the English has been limited so far to the study and opening up of the country itself. The investigation of the climate and soils, water supply, domestic products, and the character of the population, the fight against sleeping sickness, the building of roads and telegraph lines and, especially, the establishing of law and order, without which products can neither be raised nor brought to market, have so far absorbed almost all the work of the English pioneers. As the size of the country is a great obstacle to the work of experiment stations, conditions being so different in different regions that the results obtained have, comparatively, but a limited value, the governmental institutions at Khartum are sending out traveling teachers to work in the different provinces. They are obtaining satisfactory results.

Educationally, too, everything is yet in the initial stage. In the northern provinces a number of "Kuttabs" have been founded, and teachers' courses at Gordon College, Khartum, at Omdurman, Suakin, and Rufaa, are to supply instructors for them. There are also six higher primary schools, and three trade schools. The missions, too, are doing very satisfactory work for the general uplifting of the country, even where they do not make many converts; where they do, they also establish schools and hospitals. The greatest agricultural problem which confronts the government is the creation of a regular water supply, because the water needed for irrigation would either diminish the share of Egypt, or have to be taken from regions upstream which are partly on foreign territory. When this problem is solved, and the general intellectual standard of the population somewhat improved, there is good reason to hope

that the combination of foreign capital and domestic labor will secure to this part of the Sudan a foremost place among the producers of tropical and subtropical products. MARTHA KRUG GENTHE.

ASIA

The Kingdom of Afghanistan. A Historical Sketch. By G. P. Tate. ix and 224 pp. Maps and index. Bennett Coleman & Co., London, 1911. 9½ x 6½.

Having had dull experience with this style of composition, the French critics have hit upon a classification, with an unwritten wealth of connotation, as *materiaux pour servir*. It contains in full measure the material upon which the history of Afghanistan may be written. It bears every mark of careful research, of collation of a great number of rare and almost inaccessible documents, of accurate presentation of both sides of moot questions. An introduction by Sir Mortimer Durand is indicative of the appreciation in which the author's diligence is regarded by that high authority; yet Sir Mortimer does not wax enthusiastic over the result, nor does he agree entirely upon all points. In manner lacking the least spark of that dash with which the Afghan tribesmen have made their inroads upon the history of India, the matter of this volume is entitled to the most serious consideration. Very little has yet been discovered as to the genetic source of the Afghans, probably it will be little more than a pamphlet in the history of inner Asia, but an inordinate amount of space is given to the discussion of an origin from the lost ten tribes of Israel; even the missionaries have given over the attempt to write that professional mystery of their art into serious ethnography. But when the author arrives at the period of documented history he gives a concise summary of the campaigns of different Afghan rulers directed upon Persia on one frontier and upon India on the other, showing particularly the result this activity had upon the consolidation of an Afghan state. In the most modern period he is obscure, probably of political design, upon the status of Afghanistan as the buffer between Russia and England at the scientific frontier. WILLIAM CHURCHILL.

Afghanistan: The Buffer State. Great Britain and Russia in Central Asia. A Comprehensive Treatise on the Entire Central Asian Question. By Capt. Gervais Lyons. With an Introductory Note by Sir Reginald C. Hart. vii and 232 pp. Maps* and index. Luzac & Co., London, 1910. 7s 6d. 8½ x 5½.

From the time when Semiramis, Queen of Assyria, invaded India, there has been a Central Asian question, and during most of these years it has been a very complex one. A book, then, which attempts to explain the various stages and results of past invasions and the present diplomatic intrigue is valuable, and, in view of the recent disputes in Persia, enlightening; yet inasmuch as it is written by an Englishman, a representative of one of the countries in this border-land strife, one must expect to find the trend of the book favorable to the English occupancy of the Iranian plateau. The book opens with a statement of the English point of view, to wit, that Persia, Afghanistan and Western China remain independent and favorable to the British, that the Bosphorus be closed to Russia and that Russia be prohibited a port on the Persian Gulf. The value of India to the British government is given in detail, and the means of protection along the frontier of that country and the distribution and occupation

*Listed under "Asia" and "The Nearer East" in *Bull.*, Vol. 44, No. 2, Feb., 1912, pp. 157 and 158, respectively.

of the army of defense are indicated. The whole chapter is permeated with the expectation of a clash with Russia for the possession of India. In succeeding chapters, the past invasions of India and the progress of Russia in Central Asia are rehearsed. Following this review of events, the author attempts to explain the Russian point of view concerning an advance into India, and while he tries to present both sides fairly, the bogy of the advancing enemy is always present. The author describes the theater of operations which includes the lowland of Turan, the Central Asian mountain region and the plain of the Indus; and he describes the paths, railroads and trails intersecting the area, the condition and high water time of the streams and lists the passes into India. Following are chapters on the countries and peoples of this area and a statement of the present distribution of the Russian army in Central Asia. The book contains much valuable information. R. M. BROWN.

Aspects of Religious Belief in Babylonia and Assyria. By Morris Jastrow, Jr. xxv and 471 pp. Map, 54 ills., chronological lists of the rulers of Babylonia and Assyria, and index. G. P. Putnam's Sons, New York, 1911. 8 x 5½.

The prime appeal of Dr. Jastrow's book is to the students of comparative religion. Yet it is interesting to see how much of the work bears upon the geography of the Euphrates Valley, an unexpected yet on second thought wholly natural result of the fact that any work of such ripe scholarship must be broad and not narrow, fecund and never jejune. At base, the story of the great gods must be the story of the greater men who believe in them, who, in a broader view, have created them anthropomorphic. Dr. Jastrow has addressed his conclusions to those students who are interested in the study of the growth of the divine idea out of a congeries of village, municipal and racial gods keeping even pace with the growth of the earliest civilization of which we have record. To the furtherance of his object he draws extensively, always brilliantly, upon the store of literary material which fresh exploration is bringing to light in the Assyrian-Babylonian region and which is daily becoming better interpreted and better comprehended. Equally with divinity is geography revealed in the course of such study, the geography of folk movement and folk settlement. Out of this rich store we have space to note but one instance of this contribution of theology to civic geography. Associated with the temples of the alluvial plain are found tower structures in courses, to which has been assigned the name *zikkurats*. These towers, the author points out, are the machinery of the worship of the mountain gods, the "high places" of Old Testament heresies, the Jacob's ladder of an earlier myth. Their presence in the plain and in the double delta argue a movement thereunto of settlement of a race of mountaineers. We need not pursue the intricate yet convincing ingenuity of his argument in the establishment of the home land of this remote migration; it is enough to point out the method whereby the gods are made to trace out the archaic highways long ages after the wind has swept away even the dust by themselves contributed in which these ancient wanderers left their footprints. We note, however, that having served their end in this line of proof the *zikkurats*, of which the Babel tower was a type, have survived without meaning in the religious architecture which gives to the mosque its minaret and to the cathedral its twin spires. It is as much pleasure as surprise to find that the cuneiform slabs of the temple records can be read to set forth the geography of Sumer and Akkad. The gods themselves have preserved the ancient landmarks of the time when the world was young. WILLIAM CHURCHILL.

Casuals in the Caucasus. The Diary of a Sporting Holiday. By Agnes Herbert. xi and 331 pp. 22 ills. John Lane Co., New York, 1912. $4. 9 x 6.

An account of the hunting experiences of two women and a man in the Caucasus, describing a hunting trip into the highlands of Daghestan and another, over the Caucasus to the shooting grounds of the northern foot-hills. The book contains some charmingly told hunting experiences, describes interestingly the natives of the region and gives glimpses of the ways of wild life. But no definite picture of the areas traversed is possible from reading the book, and there is no map. R. M. BROWN.

India. Its Administration and Progress. By Sir John Strachey. xxiv and 567 pp. Map and index. Macmillan & Co., Ltd., London, 1911. $3.50. 9 x 6.

The history of Sir John Strachey's great work, the acknowledged standard of reference for the facts of Indian politics and economics, is embraced in the record of its progress. A soldier with that rare sympathy with the foe which seeks to leave him in the best plight after his submission, an administrator with a genius for soothing turbulent communities, the author displayed in his first edition a massive plan on which the political history of the British rule was to be written. This was in 1888. In six years the changes in India made necessary the second edition of 1894. Yet another period of eight years showed the work, already become standard, to be authoritative in scope but laggard in detail. The third edition was published in 1903. It is a great tribute to the quality of this work that so competent a student of India as Sir Thomas Holderness finds that when eight years later a fourth edition is called for he can do no better than to bring the work from the point where Gen. Strachey laid it down up to the present situation by adding notes at the bottom of the page or at the end of the chapter. Thus it enters upon a new period of that authority which it has already held during nearly a quarter of a century of great changes in India. WILLIAM CHURCHILL.

Java, Sumatra and the Other Islands of the Dutch East Indies. By A. Cabaton. Translated and with a Preface by Bernard Miall. xvi and 376 pp. Map, 47 ills. and index. Charles Scribner's Sons, New York, 1911. 9 x 6.

Very nearly a third of this volume is taken up with Java, a chapter apiece being allotted to Sumatra, Borneo, Celebes, the Moluccas and Timor. This is quite in accord with the plan of the work, for it is a monograph on the economic geography of the Dutch East Indies, and in that empire Java is paramount in commerce and administration. The introductory sketch of the discovery and varied political history of Java is brilliantly linked with the economic problems rooted therein which have tended to retard the development of the East Indies as an appendage of the crown of the Netherlands. In connection with this theme it is gratifying to find that Prof. Cabaton gives his true rank to Douwes Dekker, who raised a voice of protest to which the mother land long gave no heed. The author proves a very sympathetic observer of the great question which Holland must solve, the adjustment of the position of the Javanese in respect of their relation to the metropolitan government on the one hand and on the other to the servile class of other Asiatics by whom they are surrounded in their own home. He recognizes that it is not going to be easy to correct the errors of the stupid past nor wise to admit an undeveloped people to the scheme of European educa-

tion. Idle on their fields, yet intensely proud of their race and its past, the ambition of the Javanese is to go to school and to enter the professions; Holland need look no farther than to British India to discover what a plague may lie in the standards of the higher education. The store of material information contained in this volume will make it the authority for the general student. Prof. Cabaton has suffered uniformly at the hands of his translator; the sense is accurately rendered, but the clarity of style which marks the diction of the French text is lost. However, this may be regarded as, to a certain extent, offset by the excellent illustrations which have been added to the English edition. The translator has prefaced the work with a general chapter of his own which lacks somewhat of accuracy; still, even were it correct in each detail, this is wine that needs no bush. WILLIAM CHURCHILL.

EUROPE

The Russian People. By Maurice Baring. xix and 366 pp. 4 maps and index. George H. Doran Company, New York, 1911. $3.50. 8½ x 6.

Mr. Baring makes it plain that he is combating a Russia of fiction and the imagination. This is the Russia of the "Danicheffs" and of "Michael Strogoff," the Russia of the Third Section and the knout and the half-shaved convict train dragging bloody chains across the snowy steppes. Yet this false Russia is the real Russia for most of the world. What terror would be left to the knout if it were recognized as no more than the whip on the dashboard of every democrat wagon creaking to church along our New England highways? Mr. Baring has made a telling point in pointing out the falsity of the known Russia, and from this beginning he leads us pleasantly to an unknown Russia well worth knowing. Others have done something of this sort; we recall with pleasure a volume by Miss Hapgood a score of years ago. But the impression the predecessors have made was less, they told interesting truth and were not believed. The fault was that they neglected to take cognizance of the real and vital fact that all their readers were filled with belief in the false Russia. It is that which will give Mr. Baring's book its present and future position, that is on the assumption that stupid folk can be laughed out of their obsession. It may be that by his pleasant satire he may convert a few readers to the knowledge that there is really a Russia worth study. WILLIAM CHURCHILL.

The Building of the British Isles. Being a History of the Construction and Geographical Evolution of the British Region. By A. J. Jukes-Browne. Third Edition. xv and 470 pp. Maps,* ills. and index. Edward Stanford, London, 1911. 12s. 8 x 5½.

A new edition of this book, after a lapse of eighteen years, is most desirable. It presents in compact form a vast amount of information as to the geology of the British Isles. It is scarcely a book for general reading, as its closely printed pages contain a great number of details which cannot easily be held in mind; but as a book of reference, or for the special student of British geology, it is invaluable. On the title-page it is announced as "being a history of the construction and geographical evolution of the British region." The student of geography, however, is likely to be slightly disappointed. The volume is practically pure geology. To be sure the present form of the land is comprehensible only in the light of its past history, and hence the book is of primary importance in the study of the geography of England. As understood by the author, however,

* Listed in *Bull.*, Vol. 43, 1911, pp. 958–959.

the term geography has a decidedly limited meaning. To him it designates little save the distribution of land and sea; he pays almost no heed to questions of relief or climate.

The method of the volume is quite uniform. The geological periods are taken up in chronological sequence. Under each main division the stratigraphical evidence is first treated and numerous descriptions of the rock series are given. Then comes a section devoted to the physical geography of the period, rarely anything more than a description of the probable location of the old shore lines. If faulting or folding has taken place, the exact nature and location of the movements is carefully discussed.

Throughout the volume the reader who is abreast of modern geological thought is apt to feel that there is a good deal of conservatism. For instance, conglomerates are treated as if they were almost universally beach formations, whereas there is a growing body of evidence to show that in many, and perhaps the majority of cases, they are sub-aerial formations laid down in semi-arid regions, or at the base of mountains in more humid districts. In the same way the colors of rocks and their frequent changes in texture are rarely used as aids in determining the climatic or other variations which occurred during deposition. The Triassic period is now supposed by many to have been a time of extensive deserts; nevertheless, the author makes only a bare reference to these new views. Another of the points wherein he holds to the old interpretations is in the matter of peneplains. He considers that most of them are due to submarine erosion.

Other instances of the relatively conservative tone of the volume might be mentioned, but enough has been said to show its general character. Mr. Jukes-Browne is everywhere fair in his statement of the views of those who disagree from him. Almost invariably where two or more theories stand in opposition the one which the author does not accept is at least mentioned Thus, while the information given is not usually sufficient to enable the reader to judge fully of the merits of the case, he is at least put on his guard. Taken all in all the conservative tone of the book is of small importance, even for the most progressive reader, when compared with the great amount of most valuable information which Mr. Jukes-Browne has so ably collected from a multitude of sources.

ELLSWORTH HUNTINGTON.

La Loire: Étude de Fleuve. Par L. Gallouédec. 347 pp. Maps, ills. Librairie Hachette et Cie., Paris, 1910. Fr. 7.50.

Of all the large rivers of France, the Loire is certainly that whose geographical rôle has been most acutely influenced by the changes of historical conditions. As the river which traverses the heart of the country in almost its entire width, it was naturally predetermined to become the main artery of life for that country. In the times of ancient Gaul, when there were no land roads, it was indeed the "moving highway" for the tribes along its banks, but at the same time, owing to the difficulties which the width and the strong currents caused in crossing the river, it acted also as a barrier between those on both banks. At the time of the Roman Conquest, when land travel developed, roads were built as far as waterways were not available; but on reaching the river the road ended and travel continued downstream, even then crossing the river but in exceptional cases.

These two functions of the river, together with the two historical periods, are reflected in the oldest settlements of the Loire valley. The former is repre-

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sented by the small harbor towns and villages lined up along the river at short intervals; they indicate the ancient landings of the small craft of old Gaul, and they are always located on the higher bank above high water level. The others are cities of Roman origin, such as Roanne, Digoin, Decize, Nevers, Orléans, Blois, Tours, Nantes, and mark the spots where a Roman highway reached the river. This location made them prosperous; they soon became important centers commercially, politically, and intellectually, so that the mention of some of these names evokes some of the proudest memories of mediæval France. This renders more striking the present aspect of these places in which everything speaks of a grandeur that is past but nothing of the present, and whose most modern piers and warehouses, much too large for the business which they accommodate, date from the eighteenth century.

The explanation of this decay is, that in proportion as land travel improved and increased the drawbacks of this capricious waterway made themselves felt more keenly. Even the discomforts of the mail coach, according to Mme. de Sévigné, seemed more bearable than those of the river, and thus the court left the banks of the Loire for those of the Seine, and passenger and freight traffic, too, gradually deserted it until the advent of the steam cars dealt the last and deadly blow to the sloops.

It is this process of historical development which must be made mainly responsible for the present condition of the Loire country, much more than the pretended deterioration of the waterway itself, which has been much exaggerated. Generally speaking, the river is as good—or as bad—as it ever was; the main trouble is that transportation by land has improved. In competition with the old highways the river could hold its own; it cannot, with modern roads. In recognition of this fact the author has undertaken the meritorious task of working up the existing observations on that river into an all-sided monograph, studying the relief, soil, and climate, of the Loire basin, the course of the river, its water-supply, floods, sands, ices, and the characteristics of its tributaries. In this way he has ascertained that the dangerous and unreliable character of the river is due to natural causes, namely, to the fact that the Loire enjoys, among the rivers of France, the fatal distinction of receiving all its principal tributaries from the same region, the Central Plateau. In other rivers whose tributaries come from various parts of the country and are also better distributed along their courses, a flood or drought in the basin of one of them may be balanced by the opposite condition of another so that neither becomes too great in the main river. But in the case of the Loire all the principal branches act simultaneously in filling or emptying its bed, so that its floods must needs become more devastating, and its shallows more shallow, than those of any other river.

As this condition cannot be allowed to last, the author strongly pleads for a regulation of, at least, the part of the river between Nantes and Orléans or Briare. A navigable waterway of that length, establishing a connection between the 1,100 kilometers of waterways of the Loire system and the great canal system of France, would be the only means to re-awaken that beautiful country from the deadly sleep of its present condition. MARTHA KRUG GENTHE.

POLAR

Les Expéditions Polaires depuis 1800. Liste des états-majors nautiques et scientifiques. Par Jean Denucé. 159 pp. Index. Imprimerie J. van Hille-de Backer, Anvers, 1911. 10 x 6½.

An expansion and a partial correction of the provisional list of expeditions

in the polar regions prepared by the author for the International Polar Congress which met in 1908 at Brussels. The arrangement of the list is chronological under each of the countries engaged in the work, the first part of the book containing the Antarctic record and the second part the Arctic. As far as possible the date, the vessel, the object of the expedition, the names of the officers and scientists of each party are given. The task is a large one and it is not strange that even a second edition contains many errors. In the American list, for instance, the leader of the 1861-62 expedition is given as Francis Charles Hall, the names of the captains of the vessels in Wilkes's fleet do not agree with Greely's list, the expeditions of Leonidas Hubbard, Jr., and Mrs. Hubbard in Labrador are entered, but Wallace's expedition is not included, and in Peary's 1905-6 expedition appears the name of J. Ross Marvin, while in Peary's 1908-9 expedition, E. Ross Marvin. R. M. BROWN.

EDUCATIONAL GEOGRAPHY

Commercial Geography. A Book for High Schools, Commercial Courses, and Business Colleges. By Jacques W. Redway, F.R.G.S. viii and 408 pp. Maps, illustrations and index. Charles Scribner's Sons, New York, 1910. 7½ x 5½.

This book, a new edition, contains thirty-nine chapters, of which two are given to general principles, one each to climate and topography, two to transportation, one to cities, nine to commercial products, three to the United States, and the remaining chapters to the rest of the commercial world. An analysis of the chapter contents shows that the author's object is factual. But little attempt is made to correlate the facts of commerce and manufactures with the reasons, either geographic or economic, for those facts. The chapters on the underlying factors of climate, topography, economics and sociology are short and incomplete and are evidently not considered very important in the treatment. The style is clear, readable, interesting. Useful review topics and well-chosen illustrations add to the value of the book. It seems doubtful, however, if this class of text books brings out the great possibilities of the subject in the school room, when the separate items are given without adequate consideration of fundamental principles. F. V. EMERSON.

Climatic Control. (Black's School Geography.) By L. C. W. Bonacina. viii and 167 pp. Maps, ills., index. Adam & Charles Black, London, 1911. 2s. 7 x 5.

A pleasantly written, rather superficial but interesting little book. The author realizes the breadth of his subject, and frankly says in his preface that he has only tried to prepare "a guide to help the student to observe and think for himself." The principles of climatology are first discussed, after which comes a description of the various "types of land in relation to climate," such as equatorial forests, tropical grass-lands, monsoon belts, sand deserts, the forests, grass lands and deserts of the temperate zones, polar snow deserts, and mountains. The climatic conditions of selected countries, "representative of the different regions of the earth," are then considered, and here we have brief accounts of the climates of the British Isles, Russia, Italy, Egypt, Brazil and Greenland. Special attention is paid to the British Isles, and many smaller relations of climate and man are brought out. The influence of climate upon man is considered in three chapters, but instead of treating this subject under

the zones, or under different types of climate, our author takes it up under indoor life, outdoor life, and race and nationality. Most of the illustrations of climatic control are very familiar, and we cannot help feeling that several of them are far-fetched. For example (p. 113), in speaking of an Alpine valley which opens towards the north, the author says that it "is entirely cut off from the direct rays of the sun, with the consequence that a hideous disease called cretinism lurks among its inhabitants." We have never heard that cretinism was due to lack of sunshine. In his consideration of the influence of climate upon the color of the skin, and upon other physical and mental characteristics, our author touches upon many matters of active controversy with a very strong leaning on his part in favor of the climatic control. Curiously placed, at the end of the book, comes a chapter on meteorology, which seems to us quite out of place there. We feel sure that Mr. Bonacina's little volume will find a good number of readers, and that it will do its work well in directing attention, in an interesting way, to the importance of our climatic environment.

R. DEC. WARD.

PHYSICAL GEOGRAPHY

Physik der Erde. Von Prof. M. P. Rudzki. viii and 584 pp. 60 text figures and 5 plates. Chr. Herm. Tauchnitz, Leipzig, 1911. M. 14. 9½ x 6.

Students of geophysics will welcome this comprehensive work, which presents the results of the physical and mathematical studies of earth problems, and in a form, as far as possible, intelligible to the non-mathematical though scientific reader. In a good many chapters a knowledge of the differential and integral calculus is indeed assumed, but Prof. Rudzki shows an exceptional facility in stripping his subject of non-essentials and so laying the outlines clearly before the reader. Excepting only the subjects of earth magnetism and meteorology, the attempt has been made to cover the entire field of earth physics.

The author of this comprehensive work is Director of the Astronomical Observatory at Cracow and holds the unusual title of Professor of Physical Geography and Astronomy in the University at that place. The book is the author's German translation of his own work originally published in Polish two years earlier.

The figure of the earth he treats at considerable length in three chapters (100 pages) which are admirably clear summaries of the various calculations upon the form of the geoid, based upon gravity and geodetic measurements. It is a little remarkable that no mention should be made of the earth's departure from the spheroidal toward the modified tetrahedral figure, as clearly indicated by the distribution of ocean and continent, the disposition of ancient land masses, etc. In discussing the rigidity of the planet, though the tidal argument is given with much fullness, that based upon earthquake waves, and Kelvin's argument from continued rotation are not taken up.

The rôle of radium in modifying the effect of secular cooling Rudzki believes to be so great as probably to mask completely the loss of heat from radiation, though admitting that the time has not yet come for a definite pronouncement. He thus places himself upon the side of Joly and as against the views of Strutt that only the earth's shell to a depth of about 72 kilometers contains radium.

The appearance of this work of a mathematician with a more or less general assumption of authority, makes it pertinent to comment upon the manner in which its conclusions should be received. The name "exact sciences" as applied

to those which make use of the mathematical method, is with little doubt responsible for some misconception concerning the degree of confidence which should be reposed in conclusions within their field; for though the methods may be exact and unimpeachable, it has been notably true that mathematical investigations in the field of earth science have been based upon assumptions that are often largely gratuitous. In part this has been explained by the large scales employed, but very largely it is accounted for by the fact that the worker is far removed from the observational method which in other fields has become the dominant note of modern science. It is not so long since Lord Kelvin, with perhaps a pardonable arrogance, assured the geologist that exact mathematical calculations based upon the rate of secular cooling of the earth had made the geologists' assumptions concerning the length of geological time quite absurd. At the recent Winnipeg meeting of the British Association Sir J. J. Thomson, who had still further reduced the geologists' allowance of time, admitted in his Presidential address for the fraternity of the mathematicians that Kelvin's assertion must now be withdrawn.

To-day a new and equally insistent demand has been made by the mathematician upon the basis of extended geodetic observations interpreted to prove that the earth's outer shell is perfectly plastic and in complete adjustment above a quite definite spherical surface of compensation. This claim of Hayford, when modified by other assumptions suggested by Chamberlin, doubled the depth of the surface of compensation, and it has recently been shown by Lewis that Hayford's values depend upon a quite unwarranted assumption that within the outer shell of the earth compensation is complete. Hayford's studies in large part, and those of Hecker which have been interpreted to confirm them, do not deal directly with variations in the value of gravity, but with deflections of the vertical only. The haste with which some geologists have accepted these conclusions, suggests that more attention has been fixed upon the number and the precision of the measurements than upon the somewhat sweeping assumptions that have been coupled with them. It is because Prof. Rudzki has quoted these results with so much approval, and because Lewis's paper had not appeared at the time the "Physik der Erde" was published that these comments are necessary.

Discussing isostasy in especial relation to areas of erosion and deposition with use of Airy's assumptions, Rudzki concludes that if earth density increases with depth, isostatic sinking within areas of deposition, and elevation within areas of denudation, must come to an end. Thus despite isostatic stress an eroded upland should be reduced to a plain.

Upon the assumption that the amount of water upon the globe has remained constant, and using figures from the measure of the post-Pleistocene elevation of northern glaciated areas in connection with those for the dimensions of existing Arctic glaciers, it is derived that the maximum local thickness of the Pleistocene continental glaciers was about 1667 meters.

Professor Rudzki's application of mechanics to the problems of Alpine folding and especially to the hypothesized *nappes de charriage* will be read with especial interest, since it had before been claimed that these ingenious explanations of the observed conditions are mechanically impossible. Willis's recent discovery of a simple and more rational explanation in two systems of thrusts which have come from opposite quarters, will tend to emphasize the already existing doubt concerning the Swiss structures, which doubt Rudzki echoes.

A few only of the subjects treated in Professor Rudzki's book can be referred

to in a review like the present. As a work of reference and as a guide to the literature of the subject, it will be especially useful to geologists, and it is a volume of which account must be taken by all who are interested in those ultimate causes of earth changes which lie hidden behind the observed phenomena.

WILLIAM HERBERT HOBBS.

Aeronautische Meteorologie. Von Dr. Franz Linke. I. Teil: viii and 133 pp. Mit 43 Textabbildungen und 8 Tabellen. M. 3. II. Teil: viii and 126 pp. Mit 37 Textabbildungen und 7 farbigen Tafeln. M. 3,50. Verlag von Franz Benjamin Auffarth, Frankfurt a.M., 1911. 9½ x 6 each.

These volumes were written as a meteorological text book for air navigators whether traveling by free balloon or one of the various types of dirigibles. The important influence of the air conditions upon such flights created a demand for an explanatory work dealing, as simply as possible, with the science of meteorology and the instruments and methods used in observational work, with a special view to the needs of air travelers. The work has already been highly approved in Germany for its practicability in the hands of aeronauts.

MATHEMATICAL GEOGRAPHY

Hydrographic Surveying: Elementary. For Beginners, Seamen and Others. By Commander Stuart. V.S.C. Messum. xiv and 504 pp. Maps, illustrations, appendices and index. Charles Griffin & Co., Ltd., 1910. $3.75. 8 x 5½.

In the preface the author says that this book is intended as a guide to all those whose duty it is intelligently and correctly to report to the proper authorities the changes that are occurring in the harbors and rivers and to those who wish to carry out some original work. Part I describes the instruments used for the work; and, in this section, the book does not differ materially from other books on surveying. Part II has three brief chapters and discusses the essential and usual appurtenances of a map. This includes the description of two projections, the gnomonic and the Mercator, scale and legend. This is the weakest portion of the book, partly from the manner of presentation and partly because the application of the material, which is limited wholly to the needs of the work, is not evident at this point. The third part is headed Practical Construction and is the main portion of the text. Here is described the process of surveying by triangulation, the fixing of the coast line, the surveying of a river-mouth, sounding and locating shoals. This is illustrated by many examples and a number of plates are inserted to show the different stages of the work. An extensive list of appendices furnish additional information for the student. The book is intended for beginners but the text matter pre-supposes a knowledge of plane and spherical trigonometry.

R. M. BROWN.

GENERAL

The Periplus of the Erythraean Sea. Travel and Trade in the Indian Ocean, by a Merchant of the First Century. Translated from the Greek and Annotated by Wilfred H. Schoff, A.M., Secretary of the Commercial Museum, Philadelphia. 323 pp. Maps, ills. and index. Longmans, Green & Co., New York, 1912. $2. 6 x 9½.

In the "Foreword" with which Dr. W. P. Wilson introduces Mr. Schoff's

volume he informs us that "When the history of commerce from its earliest dawn to its present tremendous international proportions shall be carefully written, the Periplus will furnish a most interesting part of such early history, and the Commercial Museum will not have to apologize for rescuing this work from obscurity and presenting it to the general public." These sentiments, and the grammar in which they are expressed, will prepare the reader for a genuinely up-to-date treatment of a work which has hitherto been known only to scholars. Accordingly we find, on one of the earliest pages, that the title of a modern Greek commentary has been transliterated into characters which make it resemble Bantu, and that the famous port of Myoshormos appears as "Mussel Harbor" which will agreeably recall summer holidays on the coast of Maine. We are almost surprised not to find Atlantic City in the list of setflements on the East Coast of Africa and are inclined to reproach the Editor for leaving the name of Philadelphia in its Hellenic crudity on the title-page.

The historical introduction of 16 pages is followed by a bibliography in which the several editions of Vincent's great work are hopelessly confused, though the author praises them in generous terms. The translation occupies 28 pages, after which there are 245 pages of notes and a full index.

To produce a readable English version should not be hard for a student who has at his disposal translations in English, German, Italian, and Latin to aid him in interpreting the crabbed Greek of the anonymous author. Mr. Schoff follows the original fairly closely, though without that respect for the finesse of Greek Grammar which a rigorous examiner would demand in the schools. He uses Müller's text with occasional emendations from Fabricius, but as he does not state precisely where these emendations occur he is protected from any criticism of his renderings by those who do not happen to possess both editions.

The principal value of Mr. Schoff's work is in the notes, which evince industrious and wide reading. It is inexcusable, however, that he should have neglected the opportunities which were at his very door in Philadelphia for studying the history and archæology of Egypt and Nubia. To speak of Nubia as having been "a center of culture and prosperity *under the Byzantine Empire*" is making history in a very new and undesirable sense. Again, the facile touch with which he treats African ethnology will hardly impress those who have devoted any study to the subject, and archæologists will do well to skip the notes on such subjects as iron, bronze and glass. But when discussing the history of plants and manufactures Mr. Schoff is evidently on more familiar ground, and these parts of his book will be read with much interest. We owe him also some gratitude for collecting in an available form so many identifications of places and peoples from authors whose works, unlike the Periplus itself, are not in every well-equipped library. DAVID RANDALL-MACIVER.

Journals and Reminiscences of James Douglas, M.D. Edited by his Son. 254 pp. and ills. Privately printed, New York, 1910. 9 x 6.

A sketch of the life of an unusual man who came in with the nineteenth century and lived till its eighty-sixth year. Born in England, Dr. Douglas made an eventful whaling voyage to Spitzbergen in 1818, later spent a year in India, was in medical charge of an ill-fated colonizing experiment in Honduras, lived for a short time at Utica, New York, where he married, and spent the larger part of his life in Quebec, where he died. A man of large experience, wide travel and acute observation, his book contains many graphic word

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pictures of men and things all over the world and much of interest from a geographical point of view.

Beasts and Men. Being Carl Hagenbeck's Experiences for Half a Century Among Wild Animals. An Abridged Translation by Hugh S. R. Elliot and A. G. Thacker. With an Introduction by P. Chalmers Mitchell. xi and 299 pp. 100 ills. and index. Longmans, Green & Co., New York, 1911. $2. 9½ x 7.

The book gives an account of the life of a collector of animals and much interesting information concerning the animals themselves. The story of the growth of the business from an exhibition of seals in a tub at his father's house to the pretentious animal park at Stellingen is told attractively. The various ways of capturing animals are described, and there are chapters on the different kinds of animals as carnivores, herbivores, reptiles, ostriches and anthropoid apes. In the chapter on animal training, Mr. Hagenbeck explains his method of teaching his captives to perform, and it is to be hoped, as Mr. Hagenbeck prophesies, that his procedure will displace the older and cruel method of instilling fear. Many personal experiences in the handling of wild animals show some of the difficulties of collectors and many traits of wild life. Though the price of the book has been reduced from $3.50 the quality of production is maintained.

R. M. Brown.

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later.

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EDITED BY THE ASSISTANT EDITOR

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[N. B. Limiting coordinates given only for charts not listed in the Coast and Geodetic Survey "Catalog of Charts, Coast Pilots and Tide Tables. 1911."]

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Penobscot Bay, Maine. 1:80,000. Chart No. 104. June 1911. 50 cts.
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XUM

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Houston Ship Channel, Texas. 1:25,000. In two parts: (1) 29°47′ - 29°40′ N.; 95°8′30″ - 94°55′ 20″ W. (2) [29°47′ - 29°43′ N.; 95°22′ - 95°8′ W.]. Chart No. 532. Oct. 1911. 50 cts.

West Indies.

San Juan Harbor, Porto Rico. 1:10,000. Chart No. 908. Sept. 1911. 50 cts.

Pacific Coast.

San Diego to Bering Sea, West Coast [of] North America. Mercator's Projection: equatorial scale 1:7,420,000. 60°35′ - 31°00′ N.; 173°0′ - 116°25′ W. 2 colors. Chart U. Dec. 1911. 50 cts.

Los Angeles Harbor and Vicinity, California. 1:40,000. Chart No. 5143. Nov. 1911. 25 cts.

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Monterey Bay, California. 1:50,000. 37°0′0″ - 36°34′26″ N.; 122°6′20″ - 121°42′33″ W. 1 color. Chart No. 5403. Sept. 1911. 50 cts.

Greenwood to Fort Bragg, California. 1:40,000. 39°30′ - 39°7′ N.; 123°56′ - 123°38′ W. With two insets: (1) Fort Bragg Landing. 1:10,000. 39°26.5′ N. and 123°49′ W. (2) Approaches to Albion. 1:10,000. 39°13.5′ N. and 123°46.5′ W. Chart No. 5703. Nov. 1911. 50 cts.

Georgia Strait and Strait of Juan de Fuca, Washington. 1:200,000. Chart No. 6300. Oct. 1911. 50 cts.

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Harbors in Dixon Entrance and Clarence Strait, Southeast Alaska. [Six charts, viz.:] (1) Port Chester. 1:20,000. (2) Port Tongass. 1:10,000. (3) Cape Chacon and Vicinity. 1:80,000. (4) Tamgas Harbor. 1:40,000. (5) Chasina Anchorage. 1:10,000. (6) Niblack Anchorage. 1:20,000. Chart No. 8074. July 1911. 25 cts.

Tongass Narrows, Southeast Alaska. 1:30,000. With inset: Hassler Harbor. 1:10,000. Chart No. 8094. July 1911. 50 cts.

Clarence Strait: Revillagigedo Channel and Portland Canal, S. E. Alaska. 1:200,000. Chart No. 8100. June 1911. 50 cts.

[Two charts, viz.:] (1) Pybus Bay, Frederick Sound, S. E. Alaska. 1:40,000. (2) Hobart and Windham Bays, Frederick Sound. 1:40,000. Chart No. 8218. Oct. 1911. 25 cts.

Sitka Harbor and Approaches, Southeast Alaska. 1:10,000. Chart No. 8244. July 1911. 50 cts.

Fidalgo Bay and Valdez Arm, Prince William Sound, Alaska. 1:80,000. Chart No. 8519. Sept. 1911. 50 cts.

Western Entrance [of] Prince William Sound, Alaska. Preliminary Chart. 1:80,000. Chart No. 8595. Sept. 1911. 50 cts.

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Hawaii. 1:216,000. 20°49′ - 18°36′ N.; 156°35′ - 154°32′ W. 2 colors. Chart No. 4115. Aug. 1911. 50 cts.

Philippine Islands.

Northern Part [of] Philippine Islands: Manila Bay to Formosa. [Mercator's Projection: equatorial scale 1:810,000]. 21°56′ - 14°22′ N.; 118°38′ - 123°40′ E. Chart No. 4705. Oct. 1911. 50 cts.

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Mindoro and Vicinity. [Mercator's Projection: equatorial scale 1:204,000]. 13°40′ - 11°45′ N.; 120°15′ - 121°45′ E. Chart No. 4305. Dec. 1911. 50 cts.

Anchorages, Southeastern Mindoro and Tablas I. [Three charts, viz.:] (1) Buruncan Point to Pocanil Bay, Southeast Coast of Mindoro. 1:40,000. 12°20.2′ - 12°11.0′ N.; 121°14.5′ - 121°28.0′ E. 1 color. (2) Looc Bay, West Coast of Tablas. 1:40,000. 12°15′ N. and 121°59′ E. 1 color. (3) Lagara Cove and Passes southward, Southeast Coast of Mindoro. 1:20,000. 12°17′ N. and 121°23′ E. 1 color. Chart No. 4339. Jan. 1912. 30 cts.

Harbors on the Coast of Masbate. [Four charts, viz.:] (1) Port Barrera, Northeast Coast of Masbate. 1:30,000. 12°33′ N. and 122°22′ E. (2) Port Cataingan, East Coast of Masbate. 1:30,000. 12°0′ N. and 124°0′ E. (3) Masbate Harbor, Northeast Coast of Masbate. 1:20,000. 12°23′ N. and 123°37′ E. (4) Nin Bay and Port Mandaon. 1:30,000. 12°10′ N. and 123°13′ E. Chart No. 4455. Oct. 1911. 30 cts.

Port Palapag and Laoang Bay, North Coast of Samar. 1:40,000. With inset: Continuation of Catubig River to Catubig. Chart No. 4449. Sept. 1911. 30 cts.

Harbors in Cebu. [Eleven charts, viz.:] (1) Hagnaya Bay, Northwest Coast of Cebu. 1:30,000. 11°7′ N. and 123°57′ E. (2) Tuburan, Northwest Coast of Cebu. 1:30,000. 10°44′ N. and 123°49′ E. (3) Balamban Bay, West Coast of Cebu. 1:30,000. 10°30′ N. and 123°42′ E. (4) Barili Bay, West Coast of Cebu. 1:15,000. 10°7.5′ N. and 123°29.5′ E. (5) Lambusan, Northeast Coast of Cebu. 1:30,000. 11°0′ N. and 123°55′ E. (6) Dumanjug Bay, West Coast of Cebu. 1:20,000. 10°4′ N. and 123°26′ E. (7) Moalbual, West Coast of Cebu. 1:20,000. 9°56′ N. and 122°23′ E. (8) Argao, Southeast Coast of Cebu. 1:25,000 9°53′ N. and 123°36′ E. (9) Bogo Bay, Northeast Coast of Cebu. 1:30,000. 11°5′ N. and 124°1′ E. (10) Carcar Bay, Southeast Coast of Cebu. 1:15,000. 10°5′ N. and 123°39′ E. (11) Port Carmen, East Coast of Cebu. 1:15,000. 10°35′ N. and 124°2′ E. Chart No. 4465. Jan. 1912. 30 cts.

Harbors in Cebu and Negros. 1 color. [Nine charts, viz.:] (1) Dumanjug Bay, West Coast of Cebu. 1:20,000. 10°4′ N. and 123°26′ E. (2) Balamban Bay, West Coast of Cebu. 1:30,000. 10°30′ N. and 123°42′ E. (3) Dumaguete, Southeast Coast of Negros. 1:10,000. 9°18′ N. and 123°19′ E. (4) Port Canoan, Siquijor Island. 1:5,000. 9°15′ N. and 123°36′ E. (5) Tinaan Anchorage, East Coast of Cebu. 1:35,000. 10°11′ N. and 123°45′ E. (6) Bais, East Coast of Negros. 1:30,000. 9°36′ N. and 123°0′ E. (7) Bogo Bay, Northeast Coast of Cebu. 1:30,000. 11°5′ N. and 124°1′ E. (8) Barili Bay, West Coast of Cebu. 1:15,000. 10°7.5′ N. and 123°29.5′ E. (9) Jimamaylan, West Coast of Negros. 1:20,000. 10°5′ N. and 122°52′ E. Chart No. 4458. Oct. 1910. 30 cts.

Southern Part [of] Tañon Strait, Negros and Cebu. 1:100,000. 10°8′ - 9°12′ N.; 123°5′ - 123°46′ E. 1 color. Chart No. 4430. Oct. 1911. 40 cts.

Western Bohol. 1:100,000. 10°22′ - 9°23′ N.; 123°36′ - 124°16′ E. 2 colors. Chart No. 4429. Nov. 1911. 40 cts.

Iligan Bay and Vicinity. [Mercator's Projection: equatorial scale 1:200,000]. 9°23.8′ - 8°1.0′ N.; 123°7′ - 124°58′ E. 2 colors. Chart No. 4604. Oct. 1911. 50 cts.

Anchorages in Iligan Bay and Vicinity, North Coast of Mindanao. 1 color. [Eight charts, viz.:] (1) Langaran and Inamucan Bay. 1:25,000. 8°37′ N. and 123°43′ E. (2) Canauayor Anch. 1:20,000. 9°0.5′ N. and 124°50.5′ E. (3) Oroquieta. 1:20,000. 8°30′ N. and 123°48′ E. (4) Jimenez. 1:20,000. 8°21′ N. and 123°51′ E. (5) Port Mambajao, Camiguin Island. 1:10,000. 9°15.5′ N. and 124°43.0′ E. (6) Dapitan and Dipolog. 1:40,000. 8°40′ N. and 123°22′ E. (7) Iligan and Overton Anchorages and Quinalang Cove. 1:40,000. 8°14′ N. and 124°14′ E. (8) Cagayan Anch. 1:20,000. 8°30′ N. and 124°39′ E. Chart No. 4639. Oct. 1911. 30 cts.

[Two charts, viz.:] (1) Agusan River Entrance, North Coast of Mindanao. 1:20,000. (2) Nasipit Harbor, North Coast of Mindanao. 1:15,000. Chart No. 4647. Sept. 1911. 30 cts.

Jolo Island and Vicinity. 1:189,000. Chart No. 4542. Dec. 1911. 30 cts.

NORTH AMERICA.

United States.

Delaware. Chart of Leased Oyster Bottoms, Delaware Bay, State of Delaware. Surveyed by Delaware Oyster Survey Commission. 1910. 1:20,000. 39°11′40° - 39°2′50° N.; 75°26′ - 75°11′ W.

CENTRAL AMERICA AND WEST INDIES.

The Greater Antilles, Florida, Yucatan. Amérique 1,000,000e. État d'avàncement des travaux au 31 Décembre 1909. [1:13,300,000]. 32° - 16° N.; 93⅔° - 63⅔° W. 2 colors. Taf. 9, *Pet. Mitt.*, Vol. 57, II, July, 1911.

[A copy of the index map of the map of "America," 1:1,000,000, issued by the Service Géograph-

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ique de l'Armée of France. Originally published as Pl. XV of its report for 1909. The map includes the southern parts of Louisiana, Mississippi, Alabama and Georgia and the whole of Florida. As the sheets covering Florida south of 28° N. are among those already published the interesting condition results that this part of the United States has been represented cartographically on the scale of the International Map of the World by a foreign government sooner than by our own.]

AFRICA.

Belgian Congo—Uganda—German East Africa. Ethnographische Übersichtskarte des Nil-Kongo-Zwischengebietes bearbeitet von Dr. Jan Czekanowski. 1:1,500,000. 6° N. - 30° S.; 23° - 33° E. 37 colors. Taf. 11, "Ethnographie des Nil-Kongo-Zwischengebietes" by J. Czekanowski, *Pet. Mitt.*, Vol. 58, I, Jan., 1912, pp. 22–25.

[Highly important map of the region of ethnographic contact between the Sudan and the Bantu negroes, based on the investigations of the author while a member of the Duke of Mecklenburg's expedition to Central Africa. The map presents an accurate delineation not alone of the ethnography but also of the topography of the district. Thirty-five tribal divisions are recognized. Relief is represented in approximate contours in black. The authorities used are cited in the text.]

Ivory Coast. (a) Colonne du Yaro. Carte dréssée sous la direction du Chef de B'on Bordeaux, par le Lieut't Ferrand, Jean, de l'Inf'ie Coloniale, d'après les itinéraires des officiers ayant pris part à la Colonne. [1:600,000]. [7°18′ - 6°26′ N.; 7°40′ - 7°10′ W.] With inset showing general location.

(b) Colonne du Haut-Bandama. [1:1,400,000]. [8°0′ - 6°30′ N.; 6°10′ - 4°40′ W.]. With inset showing general location.

Accompany "La Pacification de la Cote d'Ivoire," by A. Terrier, *Renseign. Colon.*, No. 12, 1911, pp. 293–300.

[Valuable military surveys of hitherto unexplored territory].

Morocco. Secteur Rabat-Salé d'après la carte du bureau topographique des troupes débarquées au Maroc. [1:975,000]. [34°40′ - 33°30′ N.; 6°55′ - 5°30′ W.]. Accompanies "En Colonne chez les Zaërs" by A. de Montalembert, *Renseign. Colon.*, No. 12, 1911, pp. 314-317.

Tripolitania. Der italienisch-türkische Kriegsschauplatz in Tripolis. [Three maps:] (a) Das Operationsgebeit im nordwestlichen Tripolitanien um Tripolis, Homs (Lebda) und Mesrata bis an den Fuss des Djebel Nefusa. 1:750,000. 33°5′ - 31°50′ N.; 11°50′ - 15°30′ E. 5 colors.

(b) Plan von Tripolis und seiner Oasen mit den Befestigungen, Kasernen und Brunnen. 1:25,000. [32°54′ N. and 13°11′ E.]. 8 colors.

(c) Plan von Bengasi. 1:50,000. [32°7′ N. and 20°4 E.]. 6 colors.

Taf. 49, "Die Militärgeographie des tripolitanischen Hinterlandes" by Hübner, *Pet. Mitt*, Vol. 57, II, Dec., 1911, pp. 361–363.

[Valuable maps because of their relatively large scale. On map (a) special symbol for cultivated land, on map (b) separate symbols for cultivated fields and date groves. On map (a) Italian orthography of *jebel* [gebel] retained although French version given in title].

Tripolitania. Carta della Tripolitania e Cirenaica. Achille Dardano dis. 1:500,000. 42° - 20¾° N.; 6° - 28° E. 7 colors. With two insets: (a) Tripolitania Settentrionale. 1:2,000,000. 33¼° - 31° N.; 11½° - 15½° E. 6 colors. (b) Cirenaica. 1:2,000,000. 33¼° - 31° N.; 19½° - 24½° E. 5 colors. Accompanies *Rivista Coloniale*, Vol. 2 (Anno VI, Series II), Nos. 19-20, Rome, 1911.

[A valuable general map on a larger scale than usually accessible. In execution representative of the high standards of the Istituto Geografico de Agostini. Distinction is made between (1) cultivated regions and oases, (2) steppes, (3) rock deserts (*hammáda*, *sertr*), (4) sand deserts (*erg*).

ASIA.

Chinese Empire. Aufstandsgebiete und europäische Interessen in China. 1:5,000,000. 44° - 21° N.; 95° - 131° E. (Ausschnitt aus Langhans' Karte der Chinesischen Revolution). 7 colors. Taf. 15, "Militärgeographische Orientierung auf dem Schauplatz der Chinesischen Revolutionskämpfe" by T. v. Trotha, *Pet. Mitt.*, Vol. 58, I, Jan., 1912, pp. 63-64.

[Photographic enlargement of relevant sheets in Stielers Hand-Atlas. Regions affected by the revolution and railroad lines shown in red].

Chinese Empire—India. Der letzte Teil des Reisewegs der Anfang Januar 1909 am mittleren Salween in Britisch-Burma ermordeten Dr. Robert Brunhuber und Karl Schmitz. [In two parts:] (1) Übersicht der Reise von Dr. Brunhuber und Schmitz von Bhamo durch Jünnan nach Omati. 1:1,500,000. 30° - 24° N.; 97° - 101° E. 5 colors. (2) Sechs Reisetage von Dr. Brunhuber und Schmitz am mittleren Salween in Jünnan vom 8. bis 13. Dez. 1908. Nach den einzigen geretteten Tagebuchskizzen Brunhubers. 1:150,000. 26°10′ - 25°34′ N.; 98°45′ - 98°57′ E. 6 colors. Taf. 7, "Die Ergebnisse der Reise der ermordeten Dr. Brunhuber und Schmitz zum oberen Salween" (first part) by M. Hammer, *Pet. Mitt.*, Vol. 58, I, Jan., 1912, pp. 19–22.

[Route survey compiled from the note books of the two ill-fated explorers. Cf. also map dealing with same subject, *Geogr. Journ.*, Vol. 34, 1909, p. 609, and map of Forrest and Litton's journey in the same region, *Geogr. Journ.*, Vol. 32, 1908, following p. 328].

Eastern Asia. Asie Orientale 1,000,000e. État d'avancement des travaux au 31 Décembre 1909. [1:18,000,000]. 48° - 12° N.; 98½° -146½° E. 4 colors. Taf. 8, *Pet. Mitt.*, Vol. 57, II, July, 1911.

[A copy of the index map of the Map of Eastern Asia, 1:1,000,000, issued by the Service Géographique de l'Armée of France. Originally published as Pl. XIII of its report for 1909. Shows which sheets have been published and the extent of completion of those not yet published. Cf. second entry under "France," *Bull.*, Vol. 43, 1911, p. 551].

Persia, Afghanistan, Turkestan, Etc. Asie Centrale 1,000,000e. (Perse, Afghanistan et régions limitrophes). État d'avancement des travaux au 31 Décembre 1909. [1:17,600,000]. 44° - 20° N.; 44½° - 80½° E. 4 colors. Taf. 7, *Pet. Mitt.*, Vol. 57, II, July, 1911.

[Index map originally published as Pl. XIV of the report for 1909 of the Service Géographique de l'Armée of France. Cf. note under "Eastern Asia."]

Siberia. Die Samojedenhalbinsel (Ja-mal), (Westsiberien). Nach den Aufnahmen der Kais. Russ. Geogr. Gesellschaft 1908 unter Leitung von B. M. Shitkow. 1:1,750,000. 73°35′ - 66°0′ N.;

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65° - 75° E. 3 colors. Taf. 3, "Die Erforschung der Samojedenhalbinsel (Jamal)" (first part) by B. M. Shitkow, *Pet. Mitt.*, Vol. 57, II, July, 1911, pp. 11-14.

[Valuable map embodying the results of the Russian Geographical Society's expedition in 1908 to this hitherto insufficiently surveyed peninsula. "Ja-mal" (in the English transliteration: Ya-mal), in contradistinction to "Yal-mal", the form in general use, is stated to be the correct rendering of the name (cf. second part of paper, *Pet. Mitt.*, Vol. 57, II, p. 71). The revised form of the name as well as the results of the above exp-dition appear on the Russian chart of the Gulfs of Obi and Yenisei, 1:1,000,000, listed in the *Bull.*, Vol. 43, 1911, p. 799.]

AUSTRALASIA AND OCEANIA

Samoa. Die deutsche Samoa-Insel Apolima. Aufgenommen von Dr. Kurt Wegener, 1909. 1. Übersicht von Apolima. 1:25,000 approx. [13°49′ S. and 172°6′ W.]. 3 colors. 2. Dorf und Lagune, 1909. 1:2,500 approx. 3 colors. Taf. 44, "Die deutsche Samoa-Insel Apolima" by K. Wegener, *Pet. Mitt.*, Vol. 57, II, Dec., 1911, pp. 322-324.

EUROPE

Bulgaria, Turkey, etc. Der Schauplatz eines zukünftigen türkisch-bulgarischen Konfliktes. 1:1,000,000. 43°25′ - 40°40′ N.; 21°30′ - 29°15′ E. 5 colors. Taf. 10, "Der türkisch-bulgarische Kriegsschauplatz. Eine militärgeographische Studie" by O. Kreutzbruck v. Lilienfels, *Pet. Mitt*, Vol. 57, II, July 1911, pp 51-53.

[Photographic enlargement of the relevant sheets of Stieler's Hand-Atlas. Garrison towns specially marked.]

Central Europe. Übersicht der Neuausgabe von Vogels Karte des Deutschen Reichs mit der Erweiterung über die Alpenländer in 1:500,000. 1:1,000,000. [55½° - 45½° N.; 5° - 23° E.]. Accompanies "Zur geographischen Namenkunde Mitteleuropas: Einleitung zur Neuauflage von Vogels Karte des Deutschen Reichs und der Alpenländer" by L[anghans], *Pet. Mitt.*, Vol. 57, II, July, 1911, p. 1.

Germany. [Lageplan des Hunnenringes by Otzenhausen im südlichen Hunsrück]. 1:12,500. [49°36′ N. and 7°0′ E.]. Accompanies "Der 'Hunnenring' bei Otzenhausen im Hunsrück" by P. Seehaus, *Pet. Mitt.*. Vol. 57, II, July, 1911, p. 22.

Germany. Übersicht der Höhenschichtenkarte des Grossherzogthums Hessen im Massstabe von 1:25,000. 1:500,000. 50°54′ - 49°12′ N.; 7°50′ - 9°40′ E. Taf. 47, "Topographische Landesaufnahme des Grossherzogt. Hessen," *Pet. Mitt.*, Vol. 57, II, Dec., 1911, p. 351.

Germany. Übersicht der seit dem Jahre 1877 von der Königlich Preussischen Landesaufnahme im Massstabe 1:25,000 der naturlichen Länge veröffentlichten Messtischblätter. [1:1,000,000]. Blatt 1 [N. W. Prussia. 56° - 53° N.; 6½° - 14½° E.]. Blatt 2 [N. E. Prussia. 56° - 53° N.; 14½° - 23° E.]. Blatt 3 [S. W. Prussia. 53°0′ - 49°48′ N.; 5°50′ - 14°20′ E.]. Blatt 4 [S E. Prussia. 53°0′ - 49°48 N.; 14½° - 19¼° E.]. Blatt 5 [Alsace-Lorraine. 49°48′ - 47°12′ N.; 5°50′ - 10°30′ E.]. Taf. 14a-e, *Pet. Mitt.*, Vol. 58, I, Jan, 1912.

[Copy of the official index maps of the largest-scale government map of Prussia, the so-called plane table map in 1:25,000].

Sweden. (a) [Das nördliche Schweden zur Veranschaulichung der Lage der Eisenerzstätten zu den Ausfuhrhäfen]. [1:25,000,000]. [71° - 65° N.; 12° - 42° E.].

(b) Geologische Skizze der Umgebung von Kiruna nach H. Lundbohm. 1:1,000,000. [67⅞° N. and 20¼° E.].

Text map and Taf. 1, "Das schwedische Eisenerzlager Kiruna" by G. Greim, *Pet. Mitt.*, Vol. 57, II, July, 1911, pp. 4-8.

WORLD AND LARGER PARTS

World. Karte der Grenzen und der Genauigkeit unserer heutigen Kenntnis vom Relief der Erdoberfläche entworfen und gezeichnet von Ludwig Carrière. (Grundlage: Berghaus' Physikal. Atlas, Nr. 44). Lamberts flächentreue Azimutalprojektion. Mittelpunktsmassstab ca 1:93,000,000. 6 colors. Taf. 46, "Unsere Kenntnis der Erde" by L. Carrière, *Pet. Mitt*, Vol. 57, II, Dec., 1911, pp. 347-351.

[A graphic representation of our knowledge of the earth's surface based on a careful survey of the detailed map material extant. No maps on a smaller scale than 1:1,000,000 have been included, this scale being considered to express the outer limit of geographic knowledge laying any claim to completeness.

The cartographic delineation of the earth's surface is treated under three heads: land, coast and ocean.

The maps of the land surface are divided into those based on instrumental surveys and those based on route surveys. The following scales are chosen as the limits of the subdivisions of these two groups: for the former, 1:63,360 and 1:253,440; for the latter, 1:600,000 and 1:1,000,000.

Coasts are divided into those known, (1) from complete surveys, (2) from incomplete surveys, sufficient, however, for local navigation, (3) from general exploration for nautical purposes and (4) those lacking all investigation of a nautical nature.

Our knowledge of the ocean floor is represented by the number of soundings made. Each "square degree" within which five or more soundings have been made is colored areally: soundings in "square degrees" which contain less than five are indicated by the proper number of dots.

The results show what immense areas of the earth's surface are not well-known, according to the author's definition of that term: on land, all of North America north of the limit of fairly dense settlement in Canada (although this ignores the various detailed maps of Alaska published by the U. S. Geological Survey [Seward Peninsula, Nos. 646A-D, 1:62,500, Nos. 655-657, 1:250,000; Yukon Basin, Nos. 640-642, 1:250,000, etc]), South America, north of 22° S. and east of the Andes, the Sahara, Arabia, Central Asia and practically all of Siberia; on sea, the greater part of the ocean bottom except for the coastal strip and the continental shelf and, of the abyssal deeps, the lines followed by the cable systems of the world.

Too great stress cannot be laid upon the importance of compilations of this nature; they afford the broad generalizations without which detailed studies remain but fragmentary. (Cf. also comment on map of Africa showing the progress of exploration, *Bull.*, Vol. 44, No. 1, 1912, p. 78)].

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WORLD. Die geographische Gliederung der Erdoberfläche. Von Ewald Banse. [Mollweide's Projection] 1:100,000,000. 12 colors. Taf. 1, "Geographie" (first part) by E. Banse, *Pet. Mitt.*, Vol. 58, I, Jan., 1912, pp. 1–4.

[An attempt to divide the earth's surface into geographic units based on the consideration of anthropo-geographic as well as physico-geographic factors. Fourteen units are established. With their subdivisions these are:

(1) Europe [exclusive of Russia]: (a) Northern, (b) Central, (c) Western, (d) Southern, (e) Farther.

(2) Greater Siberia: (a) Russia, (b) Caucasus, (c) West Siberia, (d) East Siberia, (e) Kirghizia, (f) Turan.

(3) Mongolia: (a) Mountainous Mongolia, (b) Tarim, (c) Gobi, (d) Tibet, (e) Pamir.

(4) The Farther East ["Ostasien"]: (a) Manchuria, (b) North China, (c) South China, (d) Japan.

(5) [Greater] India: (a) Himalaya, (b) Punjab, (c) Hindustan, (d) Burma, (e) Indo-China, (f) Sunda Islands, (g) Borneo, (h) Celebes, (i) Philippines.

(6) Greater Australia: (a) West Australia, (b) East Australia, (c) New Zealand, (d) Melanesia, (e) Micronesia, (f) Polynesia.

(7) The Orient: (a) Atlas, (b) Sahara, (c) Greater Arabia, (d) Aryan Orient.

(8) Nigritia: (a) Sudan, (b) Abyssinia, (c) East Africa, (d) Congo, (e) South Africa [Kapland], (f) Madagascar.

(9) America [non-Cordilleran North America]: (a) Canada, (b) Missouria, (c) Appalachia, (d) Labrador.

(10) Greater California: (a) Alaska, (b) Columbia, (c) California, (d) Mexico.

(11) Andina: (a) Panama, (b) Antilles, (c) Ecuador, (d) Atacama, (e) Chile.

(12) Amazonia: (a) Llanos, (b) Guiana, (c) Amazonas, (d) Brazilia, (e) La Plata, (f) Patagonia.

(13) Arctic.

(14) Antarctic.

Whatever criticism might be made of details, the method underlying the establishment of these divisions is geographic in the broadest sense of the word.]

WORLD. Indexkarten zum Kartographischen Monatsbericht [of *Petermanns Mitteilungen*]. IV. Jahrgang 1911, Nr. 4–6, 7–9, 10–12. *Pet. Mitt.*, Taf. 6 and 27, Vol. 57, II, and Taf. 13, Vol. 58, I, July and Oct., 1911, and Jan., 1912, respectively.

[Eleven maps comprising the world on which are shown the limits of the majority of the maps listed in the cartographic bibliography for April–June, July–Sept. and Oct.–Dec., 1911, respectively. Distinction is made between geographic-topographic, geologic, physical-statistical maps and nautical charts].

OCEANOGRAPHICAL

NORTH ATLANTIC OCEAN. [Hypothetische Darstellung der Verteilung der magnetischen Abweichung im Atlantischen Ozean um das Jahr 1500. Von Prof. Dr. F. Nansen]. [Mercator's Projection: equatorial scale 1:62,000,000]. 70° - 15° N.; 80° W. - 20° E Accompanies "Die magnetische Abweichung im Anfang des 16. Jahrhunderts" by F. Nansen, *Pet. Mitt.*, Vol. 58, I, Jan., 1912, pp. 8–12.

CARTOGRAPHICAL

WORLD. Geeignete Kartenprojektion zur Darstellung der erdmagnetischen Elemente. Von H. Wehner. [1:170,000 000]. Taf. 48, note with same title by same author, *Pet. Mitt.*, Vol. 57, II, Dec. 1911, p. 351.

[Cf. similar map listed under "Cartographical," *Bull.*, Vol. 43, No. 10, 1911, p. 799].

HISTORICAL

WESTERN EUROPE AND EASTERN NORTH AMERICA. (a) Nordwestlicher Teil der Karte des Juan de la Cosa aus dem Jahre 1500. (b) Teil der Karte des Pedro Reinel [East Coast of Newfoundland]. Accompany "Die magnetische Abweichung im Anfang des 16. Jahrhunderts" by F. Nansen, *Pet. Mitt.*, Vol. 58, I, Jan., 1912, pp. 8–12.

EDUCATIONAL

UNITED STATES. Bathy-Orographical [School Wall] Map of the United States. Constructed and Engraved by W. and A. K. Johnston, Ltd., . . . Edinburgh and London. 1:4,100,000. 52° - 15° N.; 128° - 65° W. 12 colors.

[This map, although showing the same careful compilation as the other maps belonging to this series, best illustrates the lack of plasticity in the representation of relief, resulting from the use of "layer" coloring *without* hachuring, which was criticized in the *Bull.*, Vol. 42, No. 11, 1911, p. 879. The use of a tint for heights between 2,000 ft. and 5,000 ft. which is not sufficiently differentiated from the next higher group of altitudes, emphasizes this feature most unfortunately in this case, as it precludes bringing out the abrupt rise of the Rocky Mountain System from the Great Plains].

THE ATLANTIC, PACIFIC AND INDIAN OCEANS. [Three school wall maps on Mollweide's Projection, 1:20,000,000, entitled:] (a) The Atlantic Ocean [hemisphere bounded by 140° W. and 40° E.]. 11 colors. (b) The Pacific Ocean [hemisphere bounded by 110° and 70° W.]. 11 colors. (c) The Indian Ocean [hemisphere bounded by 0° and 180° E.]. 11 colors. In "New Series of Bathy-Orographical School Wall Maps", W. & A. K. Johnston, Edinburgh. Each: unmounted, 9/–; mounted, 10/–; mounted and dissected, 12/–.

[For reference to this series as exemplified by the map of Europe see under "Educational", *Bull.*, Vol. 42, No. 11, 1911, p. 879. The above three maps, particularly those of the Atlantic and of the Pacific Ocean, are especially valuable for teaching the form of the ocean basin, because the oceans are rarely represented in their totality on wall maps. Ocean depths are indicated by six shades of blue, with 100, 1000, 2000, 3000 and 4000 fathoms as their limits. The nomenclature used for the forms of sub-oceanic relief is that adopted by the commission appointed at the Seventh International Geographical Congress. Traces of Sir John Murray's nomenclature, however, are visible in the use, on the map of the Pacific, of 'Tuscarora Trench' instead of 'Japan Trough', although the latter term, consistent with the others used, appears on the map of the Indian Ocean].

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FIG. 1—Nameless Peaks of the Northern Selkirks. Valley of the north fork of Gold Stream on the left, valley of Windy River on the right. The main Selkirk Divide follows the ridge in the right foreground. View looking west from above Silvertip Pass.